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Vol. VIII—No. 11 NOVEMBER, 1902 $1.00 a Year; 10 cts. a Copy

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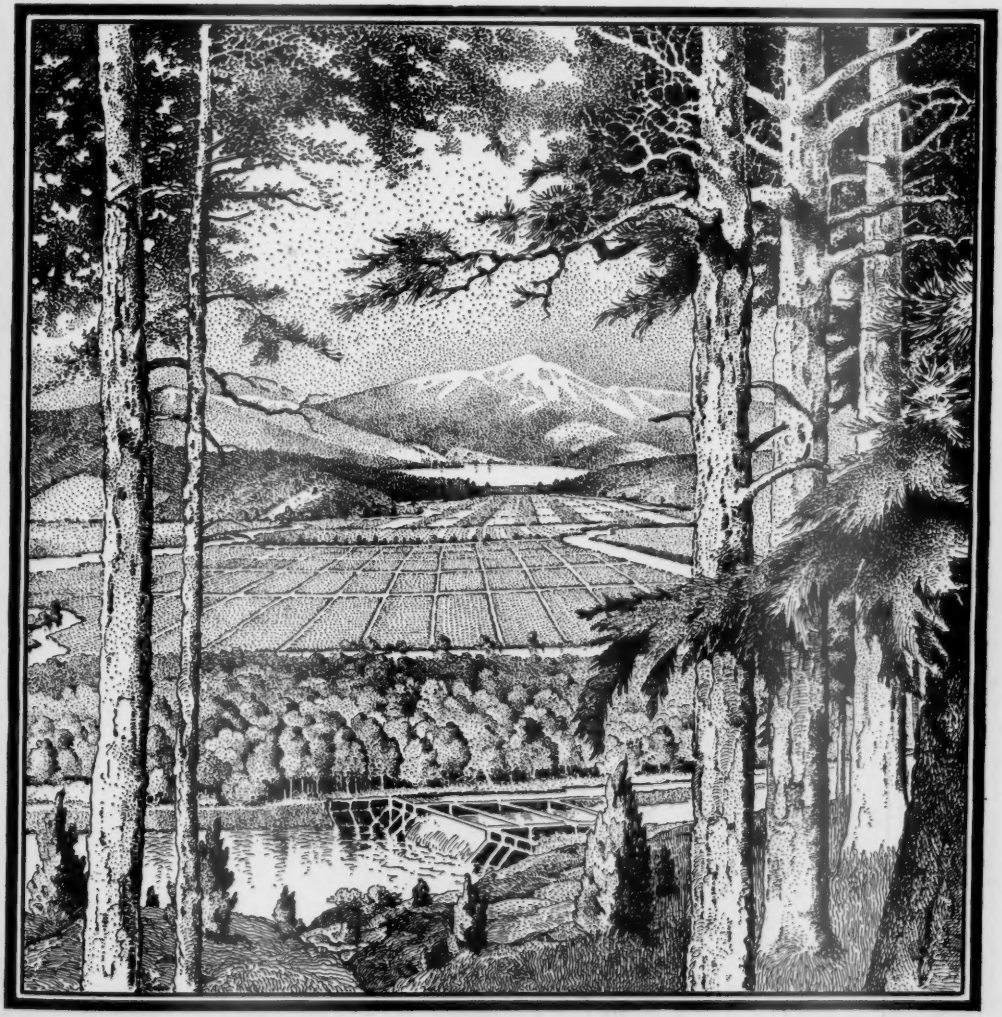

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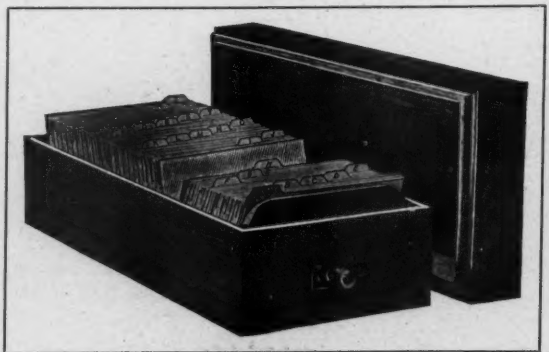

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1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

Forestry and Irrigation

H. M. SUTER, Editor and Publisher

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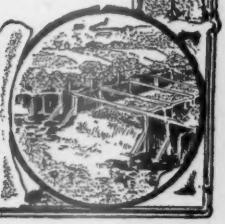
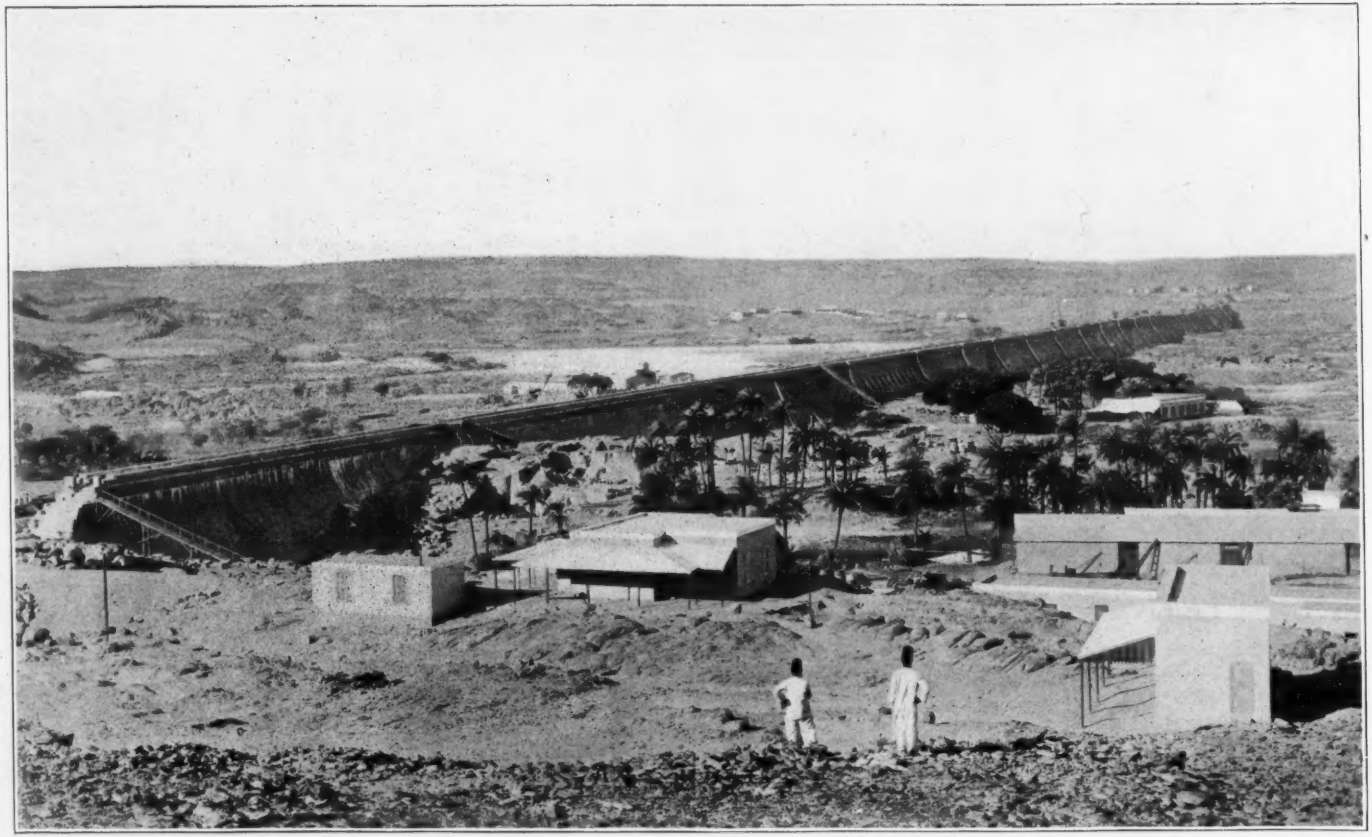




THE NILE RESERVOIR DAM AT ASSUAN, EGYPT, TO BE DEDICATED DECEMBER 8. (SEE PAGE 441.)

Forestry and Irrigation.

VOL. VIII. NOVEMBER, 1902. No. 11.

NEWS AND NOTES.

Meetings. The twenty-first annual meeting of the American Forestry Association will be held in Washington on Wednesday, December 10. The election of officers, presentation of reports by the board of directors and treasurer, and such other business as requires to come before the entire Association will be transacted.

The second annual meeting of the Iowa Park and Forestry Association will be held at Des Moines, Iowa, December 8 and 9.

The forty-fifth annual meeting of the Missouri Horticultural Society will be held at Springfield, Mo., December 2–4.

To Prevent Forest Fires. The immense losses caused by forest fires in Oregon and Washington during September, a detailed account of which is printed elsewhere in this number, has aroused lumbermen and property-owners generally in the northwest to the seriousness of the fire question. Later reports show that the losses from these fires was much greater than was at first supposed.

The trade press, so often silent in such matters for fear of disturbing business conditions, has taken up the fire question. *The Pacific Lumber Trade Journal* for October contains a summary of the losses in the recent fire and calls for action by the people of Oregon and Washington. This number also contains a number of replies to a circular letter sent out to representative lumbermen by the editor, Mr. Beckman, asking for suggestions for the prevention of fires. The following is an extract from Mr. Beckman's letter:

"Suggestions of proper remedies have been numerous, some taking the position that there should be a patrol of timbered regions during the warm parts of the year, the timber owners to pay all the expenses of such a system, while others believe that the aid of the government should be sought. The former seems to be possible, but it is quite likely that the government will do nothing except what will protect its own reserves. It is a question for the people of this state to settle, and that being the case we wish you to help us in starting a movement that may bring invaluable results.

"The impression prevails to some extent that the fires are started by ranchers, who in burning brush while clearing their land are not sufficiently careful to prevent the fires getting beyond their control; but it must be remembered that some of the worst fires have originated in logging camps, and that all need to be careful. It is a question on which all should get together for the good of the states."

The Oregon Timberman has also taken up the matter, and in its October number prints a number of letters on the fire question from prominent lumbermen. *The Timberman* concludes its leading editorial as follows:

"There is neither sense nor justice in attempting to disguise these self-apparent facts, and if the owners of timber lands and the people of Oregon and Washington in general will awaken to a realization of these dangers and pass remedial laws, the lesson learned by the 1902 fires will not have been too dearly bought."

The trade press can do much to arouse the people to action on the fire question; the example set by *The Pacific Lumber Trade Journal* and *The Oregon Timber-*

man is most commendable. The question is not how *to extinguish* forest fires, but how *to prevent* them.

A Practical Fireplace

Mr. Alfred Gaskill, of the Bureau of Forestry, while traveling in Finland, found that the men who live in the woods during cold weather commonly warm themselves at a unique fireplace, which has several advantages over the ordinary open camp-fire that we use. It is simply a straight-grained log, twelve or more inches in diameter, split in half, with the two parts separated about four inches by blocks of wood or stones near the ends. A fire of chips and small sticks is built within the cleft, which, gradually eating into the log itself, produces great heat.

Mr. Gaskill, who furnished the photo from which the accompanying illustration was made, tried this fireplace in camp last summer and found that it worked admirably in front of a tent on a cold, wet day. After the log was well heated by as large a fire as the cleft would hold, a few dry sticks added now and then were enough to keep the fire alive and thoroughly warm the tent.

The device requires little fuel, is infinitely less likely to set the woods on fire than a fire built upon the ground, and will keep going in the rain. Of course, when the wind is contrary, the dweller must choose between the cold and more smoke than is pleasant. In the open, or where the face of a camp can be shifted, it is like a fire built upon the ground.

In Favor of Forestry and Irrigation.

The following resolution passed by the National Association of Agricultural Implement and Vehicle Manufacturers at their Ninth Annual Convention at Minneapolis, Minn., in October, shows the attitude of this prominent organization toward the questions of forestry and irrigation and The National Irrigation Association:

"We reiterate the recommendation of the resolutions passed at our last convention at Kansas City, urging every member of this association to be members of The National Irrigation Association, and we further urge that each and all of our members should do whatever is practicable to enlarge the membership of The National Irrigation Association, and in every way possible aid the work of that association in maintaining an active and correct public sentiment as to forestry and irrigation, and organizing the friends of the national irrigation movement so that their influence may be united and therefore effectual."

Irrigation in Grand River Valley.

The following extract from a letter from Mr. G. H. Matthes, Grand Junction, Colo. contains some interesting information on the value of irrigated lands in that region:

"Inquiry into the normal size of ranches in this valley brings forth the interesting fact that a 10-acre lot in orchard is all that one man can attend to. This statement I have heard repeated on all sides, and it is next to proverbial in this valley. Not only is a 10-acre ranch sufficient to sustain one family; it is in reality more than sufficient. There are many 5-acre ranches in orchard that sustain single families. From what I can gather, the ideal ranch in this valley consists of 10 acres in alfalfa and 10 in orchard. The care of 20 acres so disposed of keeps one man hustling. I find that the ranches of the wealthy fruit-growers on "Fruit Ridge," people that have made their money in fruit-growing, range from 10 acres to 40 acres, the greater number being in the neighborhood of 20-acre tracts of the best orchard land, and worth up to $1,000 per acre. A single acre was sold for this price last year on "Fruit Ridge," and is said to have netted its owner $1,400 the same season.

"I find that the low duty of water in this valley—that is, one-half inch to an acre, or about 80 acres to a cubic foot—has an intimate relation to the size of the ranches. Where a man has to irrigate a few acres with a small stream of a certain nominal number of inches, it it not only slow but laborious to get the entire area properly irrigated. As fre-

A PRACTICAL FIREPLACE.

quently heard stated, it is difficult to handle a stream of less than 10 inches to any advantage. This difficulty has led to "rotation." For instance, one ranchman will irrigate one day with 10 inches (where 10 inches is all he is entitled to), using 10 inches from his neighbor, and the next day his neighbor will do the same thing, and thus even the amount. In other words, the rotation plan, which is generally conceded to be the most economical, is gradually being adopted more as a matter of convenience than for economy's sake."

Notes About Forest Reserve Officers. Miles P. Isenberg, of Hood River, Oregon, has been appointed supervisor of the northern half of the Cascade Reserve in Oregon.

S. B. Ormsby, superintendent of the forest reserves of Oregon, has left the service. Mr. Ormsby was appointed in 1898, and was one of the first forest reserve officers to enter the service.

Mr. Grenville Allen has been appointed supervisor of the Mount Rainier Forest Reserve in Washington. Mr. Allen is a long-time resident of Washington, a graduate of Yale (engineering), and son of Professor Allen, the distinguished chemist. Mr. Allen entered the service last spring as a ranger of Class I (assistant and supervisor), and was promoted at the request of Superintendent D. B. Sheller.

S. W. Blakesley, supervisor of the Yellowstone Reserve, in Wyoming, has resigned. His place has been taken by W. H. Pearce, of Big Piney.

Captain Seth Bullock, supervisor of the Black Hills Forest Reserve, is making every effort to fight the bark beetle pest, which has spread steadily for over ten years, and has now reached a point where it threatens the entire Black Hills forest. In a circular to owners of patented lands, claims, etc., Mr. Bullock clearly sets forth the necessity of fighting this common enemy, gives directions, and offers assistance in distin-

guishing and marking the infested timber.

C. M. Day has been appointed supervisor of the northern half of the Bitter Root Forest Reserve, in Idaho.

Tree Planting in Northwestern Texas. The people of northwestern Texas are beginning to realize the importance of forest-tree planting. At the request of the Fort Worth and Denver City Railway Company, an agent of the Bureau of Forestry recently made a trip from Fort Worth to Texline with a view of securing the coöperation of farmers along its line in forest-tree planting. Mr. George L. Clothier was detailed by the Bureau of Forestry to coöperate with the railroad in encouraging planting in that section. As a result of his work sixteen planting plans have already been made for property-owners there. Instructions regarding planting were given to about twenty-five others who expect to plant extensively in the near future.

No section of the United States is more in need of forest trees than northwestern Texas, for the high prairies of this region are exposed to the prevalent south winds, which are frequently very hot and dry. The rainfall, which would be ample in a cooler climate, is rapidly dissipated by evaporation; agriculture is thus exposed to severe injury by climatic conditions. The winds in exposed situations have the power to take up by means of evaporation more than six feet of water during the year. This great demand for moisture would consume one and a half times the rainfall of humid New England. Experiments have shown that the reduction of the velocity of the wind from 25 miles per hour to zero, reduces its power of evaporation to one-sixth. In other words, if the average velocity of the wind at the surface of the ground for one year should be found to be 25 miles per hour and the evaporation for the same period should be found to be 72 inches, a reduction of the velocity of the wind at the same place to a dead calm would result in a reduction of the evaporation to 12 inches.

The importance of forest belts for wind breaks in an arid or semi-arid country can scarcely be overestimated. The great question which concerns the welfare of Texas farmers is the conservation of the natural rainfall of the region. The records of the Weather Bureau for the past ten years show an average annual rainfall of 21.55 inches at Amarillo. Large areas in Russia famous for the production of wheat have less than 15 inches annual rainfall, and the celebrated Red River Valley of the North receives only about 20 inches. Western Texas receives sufficient rainfall for the growth of ordinary agricultural crops if all of it could be utilized. The planting of trees will be one of the influences that will very materially assist in the much-needed conservation of the moisture.

From the information derived by an agent of the Bureau of Forestry it is safe to say that there is quite a list of forest trees that may be grown successfully along the line of the Fort Worth and Denver City Railway. As far west as Clarendon, the Black Walnut and Pecan may be planted with fair prospects of success. The Black Locust will thrive from Fort Worth to Texline, while the Russian Mulberry, Osage Orange, and Red Cedar can be grown from Fort Worth to Amarillo. Where moisture is abundant the Cottonwood can be grown successfully throughout this region. Other good trees for the locality are White Elm, Hackberry, and Honey Locust.

Hartford Takes up Forestry. An interesting piece of forest work has been begun on the watershed of the city of Hartford, Conn., under the direction of Mr. Henry S. Graves. The watershed is owned by the city, and covers an area of over two thousand acres. During the past summer Mr. Graves prepared a detailed working plan, which is now being put into execution. The plan includes the necessary thinnings in the forest, which covers about one thousand acres, and the planting of over six hundred acres of open fields and pasture land. A resident forest ranger, Mr. L. E.

Photo by H. H. Alexander, Colorado Springs.

DELEGATES TO THE TENTH NATIONAL IRRIGATION CONGRESS, AT COLORADO SPRINGS, OCTOBER 6–9.

Goodrich, is employed by the water board, who has immediate executive charge of all the work. About fifty acres will be planted the first year, and about one hundred acres of woodland will be thinned for improvement. This is an excellent opportunity to demonstrate practical forestry in all its phases.

Forest work of the same nature is being conducted by the Bureau of Forestry on the watershed of the city of Woonsocket, R. I., and that of the Metropolitan Water Board at Clinton, Mass.

Water Power in the Central West. The United States Geological Survey, in its investigations of the water resources of the country, has been making recent studies of the water powers and water resources of the central western states.

Great interest is being shown in the development of water power upon the streams in these states. Many years ago a number of large powers were developed there, and manufacturing cities of considerable size have since grown up about them. The great power on the Mississippi at Minneapolis is one of the best examples, being utilized for flour mills, the generation of electricity, and for various kinds of manufacturing. There yet remain a number of falls which may be utilized on the Wisconsin River, on the Mississippi River and its tributaries above St. Paul, on the Forks River in Wisconsin, and on several of the larger streams of Michigan. The value to a community of such a natural source cannot be overestimated.

Recently the great development at Sault Ste. Marie has been completed and water turned into a canal. Duluth is also looking forward to the utilization of part of the water power upon the St. Louis River, where the plans now completed show a fall of over 700 feet and a power reaching a capacity of 100,000-horse power. This would make Duluth not only a great shipping point, but probably the center of flour-milling and other forms of manufacturing which require large amounts of power. The wheat from Minnesota and Dakota would be stopped at Duluth long enough to be ground into flour and then forwarded to the east by way of the Great Lakes.

Excepting for the large power at Minneapolis, the market is greater than the supply, and plans are now in contemplation looking to the development of electricity upon the St. Clair River in Minnesota, to be used for electric lighting and electric car service. There are many other points in this region where power is now being wasted, but with the concentration of capital the larger power possibilities are being developed to the great benefit of the northern central states.

Survey of Forest Reserves. An important work in the survey and investigation of the government forest reserves by the United States Geological Survey is this season in progress under Mr. Henry Gannett, geographer. It consists in the extension of topographic surveys, including triangulation and spirit-leveling of the reserves, for the construction of maps, and also in the botanic and economic examination of the forests to determine the amount and variety of standing timber, the damage done by forest fires, and other existing conditions of the reserves.

Work this season has been directed particularly to the reserves in Arizona, New Mexico, and Utah.

In Arizona the examination which was commenced last year and carried over the northern section of the San Francisco Mountains Forest Reserve is being continued to cover its southern portion. A like examination is being carried on in the Black Mesa Reserve of Arizona.

In New Mexico the Gila River Reserve is being examined and surveyed, as is also the Uintah Reserve in Utah. In the last-named state investigations are being extended to the area of the proposed forest reserve in the Wasatch and adjacent ranges, with special reference to the needs of the agriculturist and the protection of the water supply of the streams flowing from the region

for the irrigation of lands in the valley floors.

Assistants to the geographer in charge are Messrs. F. G. Plummer, Arthur Dodwell, Theodore F. Rixon, and H. B. Ayres.

Forest Work in Texas The Bureau of Forestry has sent a party of foresters and student assistants to Kirbyville, Texas, to make a working plan for the management of a million and a quarter acres of longleaf pine lands owned by the Kirby Lumber Company.

The party will be divided into four camps. One permanent camp will be established at Kirbyville; the three other camps will move from place to place, wherever the work takes them. Each camp will be in charge of an expert forester. The entire work will be directed by Field Assistant Thomas H. Sherrard. Dr. A. D. Hopkins, of the Division of Entomology, U. S. Department of Agriculture, will make, in coöperation with the Bureau of Forestry, a special study of insects found on the Kirby Lumber Company's timberlands.

The present undertaking is begun in response to the request of the Kirby Lumber Company that its timberlands be put under such management that they will yield a steady supply for its lumber mills. The working plan will be the most extensive of any yet made in this country for a lumber company, and the work will require the services of about 40 men for six months.

Wood-Eating Ants. It is of interest to note that ant eggs are a commercial product for sale on the market in dried form at all times of the year. These eggs are imported from Africa, where they are found in large quantities in the huge anthills, which are quite common in that country. The ant that lays these eggs is not a true ant, but a termite—a class of insects which feed on wood to such extent that they do great damage to buildings in tropical countries.

The accompanying illustration shows a termite's nest on the end of a fence post in Cuba. These eggs are sold in dry form and are used as food for young pheasants, and are worth about fifty cents a pound. They are scalded until they swell to their natural size, and then mixed with meat scrap and corn meal and fed to young birds of the pheasant type.

TERMITE'S NEST ON A FENCE POST IN CUBA.

An Old Cedar. In a letter to *Science*, Dr. Charles E. Bessey, of the University of Nebraska, states that in the Garden of the Gods, near Pike's Peak, Colorado, there are many large specimens of the Brown Cedar, *Juniperus monosperma* (Engelm.) Sargent. During a recent visit to that place it occurred to Dr. Bessey that these trees must be very old. He was fortunate enough to find the stump of a recently cut tree. on which it was easy to distinguish the annual growth-rings. These were counted for a section of the trunk, care being taken to select a portion in which the rings were of average thickness, and on this basis the number for the whole stump was calculated. In this way it was found that

this particular tree was between eight hundred and one thousand years old. In other words, this tree was a seedling some time between the years 900 and 1100 A. D.

A Unique Society. The employés of Thomas Meehan & Sons, the well-known nurserymen of Dreshertown, Pa., who for some time have been studying botany at the nursery office, have formally organized a horticultural society. A constitution and by-laws were drawn up and adopted. The society will be known as the Thomas Meehan Horticultural Society, so named in honor of the late Thomas Meehan. The officers are: Robert B. Cridland, president; Ernest Hemming, vice-president, and S. Newman Baxter, secretary and treasurer.

For Irrigation in Northern Wyoming. Investigations by the United States Geological Survey are now in progress in northern Wyoming with a view to extending the use of the available water supply in that portion of the state. Jeremiah Ahern, an engineer of the Geological Survey, is in charge of the work. Particular attention is directed to the eastern slope of the Bighorn Mountains, where important storage problems on the headwaters of the Sulphur, Powder, and Tongue Rivers await solution.

These streams, after leaving the mountains, flow through fertile bench and valley lands which, with proper irrigation, would be valuable for agricultural development. The rainfall of the region is light during the time water is needed for irrigation, but the winter snows on the mountain slopes are unusually heavy and furnish large quantities of water to the streams. The source of supply at present is an extremely unsatisfactory one, for the warm rains of spring melt the snow rapidly and produce disastrous floods, in which large quantities of water pass through the streams unused.

There are, however, a number of lakes in the region favorably situated to be used for storage. One of these is Lake de Smet, whose water surface is said to be 30 feet below the lowest part of its rim. In this lake it is proposed to store part of the headwaters of the Powder River, thus saving a large body of water for irrigation which is now entirely wasted.

Mr. Ahern has been engaged during the present summer in gaging the flow of the streams on the eastern slope of the Bighorn Mountains and investigating the possibilities and probable cost of water storage in the region.

Soil Investigations. The Bureau of Soils of the U. S. Department of Agriculture is doing valuable work, under the direction of its chief, Mr. Milton Whitney, in alkali investigations, and particularly where the alkali problem is complicated by irrigation, where the introduction of water brings the alkaline salts to the surface. In northern Africa, and particularly in Algiers and Egypt, conditions exist which are so analogous as to be almost identical with those which affect Arizona, New Mexico, and southeastern California.

To a great extent difficulties which attend the irrigation of alkaline areas have been overcome in Egypt, and it was to investigate Egyptian methods that the Bureau of Soils sent Mr. Thos. H. Means, in charge of the United States Soils Surveys, on an extended tour through southern France, Algeria, portions of the Sahara, and Egypt. He is peculiarly fitted to the task he had in hand, owing to his investigations of the alkali problem and its connection with irrigation in the southwestern part of the United States

At the same time, and accompanying Mr. Means, the department sent Mr. Thos. H. Kearny, botanist, of the Bureau of Plant Industry, to investigate alkali resistant growths. They sailed from New York July 1, of this year, and Mr. Means has just returned to Washington.

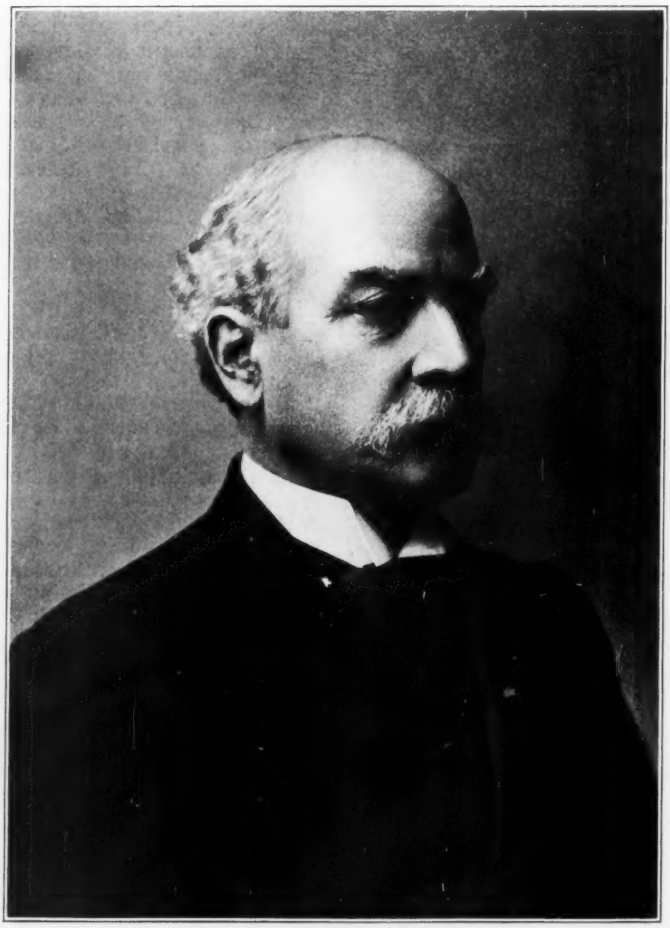
He made, in addition to soil investigations, a careful study of irrigation works in all the countries visited. Egypt, he says, is now one of the most prosperous

agricultural countries in the world, with crops superior to any raised elsewhere. This is mainly due to the magnificent and untiring efforts of the English engineers in charge of irrigation and similar work.

Probably the most important of these irrigation works is the Nile Reservoir Dam at Assuân, at the first cataract of the Nile. This is the largest dam of its kind in the world, being 1¼ miles long. It impounds the water at the period of high tide and stores it for the period of low water. It is a sluice dam, as shown in the frontispiece of this issue, which is made from an official Egyptian government photograph, furnished by Mr. Means. An interesting fact concerning its construction is that it is 35 feet lower than its intended height, though the foundations have been made to support the additional masonry should it ever be constructed. This decreases the dam's capacity just one-half; the reason exists in the temple of Philæ on an island up stream, which would be submerged if the dam were carried to its planned height. As this temple is one of the most interesting and best preserved in the country, its complete annual submersion was not to be tolerated. One engineer wanted to build the island, temple and all, to the required height, while another suggested carrying it away bodily to some other place. As it is, the dam remains one-half as useful as it might be if it were not for the temple. As it stands now, the dam has a capacity of 35,000,000,000 cubic feet of water, held at a height of 48 feet above the zero of the Assuân gage. The water impounded will suffice for the irrigation of 300,000 acres of cotton and sugar cane, and will be worth $50,000,000 to the country. The dam, completed to its full height, will cost about $8,750,000, and doubling its present capacity this will mean $125,000 for 1,000,000,000 cubic feet of water, or, allowing for evaporation, $150,000 per 1,000,000 cubic feet.

On December 8 this dam will be dedicated with considerable ceremony, in the presence of the invited representatives of many nations. FORESTRY AND IRRIGATION will present a full account of the dam and its value in a subsequent issue, the article being one of a series which Mr. Means will write for this magazine on the irrigation works of the countries he visited, with reference to their significance and applicability to similar conditions in the United States.

ROW OF HARDY CATALPA TREES ON THE GROUNDS OF MR. GEO. A. ROOT, TOPEKA, KANSAS. TREES EIGHTEEN YEARS OLD, HEIGHT 30 FEET, AND DIAMETER TWO FEET FROM THE GROUND 10 INCHES. PHOTO REPRODUCED THROUGH COURTESY OF MR. GEO. W. TINCHER.

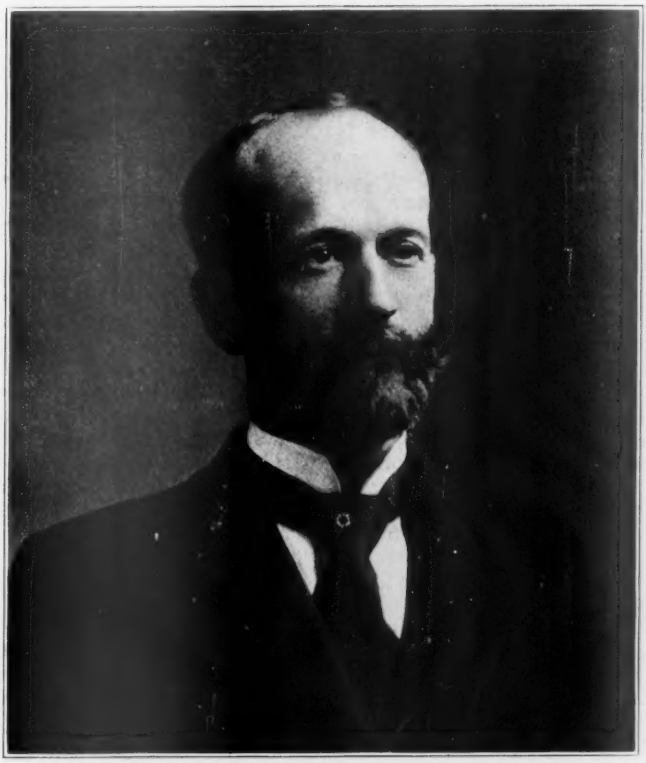


HON. ETHAN ALLEN HITCHCOCK,

SECRETARY OF THE INTERIOR.

IN February, 1899, Mr. Hitchcock entered upon the duties of Secretary of the Interior, becoming a member of President McKinley's Cabinet. In this position he has given personal attention to matters of forestry and irrigation, one of the duties of his office being the care and protection of the forest reserves. The passage of the Reclamation Act of June 17, 1902, puts at his disposal the control of the reclamation fund, now amounting to over $8,000,000. Upon him is dependent the inauguration of a new system, which, if wisely administered, means a rapid progress in the development of the arid region and indirectly of the whole United States.

Ethan Allen Hitchcock, Secretary of the Interior since February 20, 1899, was born at Mobile, Ala., September 19, 1835. He attended private schools at Nashville, Tenn., and completed his course at a military academy in New Haven, Conn., in 1855. Mr. Hitchcock settled in St. Louis, and engaged in the mercantile business until 1860, when he went to China to enter the commercial house of Olyphant & Co., of which firm he became a partner in 1866. He retired from business in 1872, and spent two years in Europe. He returned to the United States in 1874, and was engaged as president of several manufacturing, mining, and railway companies until 1897, when he became United States Minister to Russia, and in 1898 was appointed an ambassador.



HON. CHARLES D. WALCOTT,

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

MR. WALCOTT, as Director of the Geological Survey, has had charge of the mapping of the United States and the study of its resources. Among other duties, there has been entrusted to him the examination of the extent to which the arid lands can be reclaimed: the measurement of streams, the surveys of reservoir sites, and the obtaining of all data leading to the construction of irrigation works. Under the new reclamation law, the Secretary of the Interior has been designated as the responsible officer in charge of this great work, and he in turn has authorized the Director of the Geological Survey to proceed with the work, since in many respects this is a continuation of the investigations carried on through many years. Mr. Walcott's wide acquaintance with the West and his personal knowledge of the conditions existing there, together with his experience in directing a large organization, render him particularly well fitted for the conduct of this important work.

Mr. Walcott was born at New York Mills, N. Y., on March 31, 1850. He was educated at the public schools in Utica, N. Y., and early showed a predilection for nature-study, particularly geology. He became an assistant in the New York State Survey in 1876; he was appointed an assistant geologist in the U. S. Geological Survey in 1879, the Cambrian rocks and faunas of the United States being his especial subjects of inquiry. He presented his Cambrian researches before the International Geological Congress in London in 1888. Since 1894 Mr. Walcott has been Director of the U. S. Geological Survey. He was the Honorable Curator of the Department of Paleontology from 1892 to 1897, and since 1898; from January, 1897, to July, 1898, he was at the head of the National Museum, with the title of Acting Assistant Secretary of the Smithsonian Institution; he is also a member of the National Academy of Sciences and various other scientific bodies, and Secretary of the Carnegie Institution of Washington.

RECLAMATION OF THE ARID REGION.*

THE RIGHT FUTURE POLICY OF THE STATE AND NATIONAL GOVERNMENTS.

BY

GEORGE HEBARD MAXWELL,

EXECUTIVE CHAIRMAN OF THE NATIONAL IRRIGATION ASSOCIATION.

THE people of this whole country, and especially the western half of the United States, are thoroughly aroused to the gigantic possibilities of national benefit which would flow from the reclamation and settlement of the arid region under a national irrigation policy. But there are comparatively few who realize that many things must yet be done to accomplish that result. The national irrigation act merely brought us to the threshhold of the problem. It opened the door just far enough to see the vast benefits that lie beyond if we can get the door thrown wide open, so that the people of this generation may enter and enjoy them. Mere appropriations from Congress will not solve the question, no matter how large they may be. We must not only get larger appropriations, but we must put down a foundation of public sentiment on which to build, which will insure an enduring structure.

In the first place the commercial and manufacturing interests of the country, who will benefit just in proportion as the whole people benefit, and who have no local or personal selfish interests to subserve, must be permanently organized throughout the whole United States to carry on a great educational propaganda to awaken the people to a continuing realization of the vast importance of this problem, and to maintain an active and right public sentiment with reference to every phase of it.

THE NATIONAL IRRIGATION ASSOCIATION.

The National Irrigation Association has now a membership of over two thousand of the leading merchants and manufacturers of the United States. That membership must be increased to not less than twenty thousand. Every commercial and manufacturing association, local or national, must be affiliated with The National Irrigation Association, as so many of them are now affiliated. Each and all of them must have an authorized representative as a member of the National Advisory Council of The National Irrigation Association.

The educational propaganda which The National Irrigation Association has been carrying on for the last three years, and which has changed the public sentiment of the east from opposition to a generally favorable sentiment, must be enlarged tenfold and carried into the west as well as into the east. The people of the west must become familiar with the correct solution of every phase of the irrigation problem. Every citizen interested in irrigation development, from the irrigator to the merchant with whom he deals, must be united to work to a common end along right lines.

OBSTACLES TO BE OVERCOME.

We have had to contend against wrong theories emanating from the west from the beginning of this movement. We have fought our way over them, one at a time, inch by inch and step by step, until we have finally overcome most of them. First, we had to defeat State Cession ; then we had to defeat the State Leasing Bill ; then we had to defeat the State Engineer's Bill. All of these turned the control of the reclamation of Uncle Sam's farm over to the state politicians. All of these measures were either advocated or approved at one time or another by Elwood Mead,

*Address delivered before the Executive Committee of the Omaha Commercial Club, October 14, 1902.

the irrigation expert in charge of the irrigation investigations of the office of experiment stations of the Department of Agriculture.

But the ghost of State Control, like that of Banquo, will not down. Mr. Mead, ever since he has held that office, has used the influence which it gives him to try and induce the adoption in every western state of a code of water laws providing for an administrative system similar to that of Wyoming, where the water is distributed by a corps of state ditch tenders appointed by state officials.

Such a system as this is the very thing that should not be created where it does not already exist. It puts the control of the distribution of the waters of a state in the hands of a great political irrigation machine controlled by state politicians, and raises innumerable possibilities of complications between the state and national governments in carrying into actual operation the National Irrigation Act.

HOME RULE IN IRRIGATION.

What is wanted is the exact contrary of this theory of a centralized political state control of irrigation.

"Home rule in irrigation" should be the slogan of the irrigators of the west from this time on. The individual irrigator should manage the distribution of the water from his own ditch on his own farm. The land-owners under each canal system, large or small, should manage its own affairs in practically the same way, distributing the water from the canal to the farmers who are entitled to it. Where more than one canal system takes water from a single stream, they should all be organized together into one association to manage their mutual interests and divide the water among themselves.

If public officers are necessary, each drainage basin should be organized separately into an administrative district having power to elect its own water commissioners and ditch tenders. No such officers should be appointed and put over any irrigated community by any governor or any state board of any kind, and no such administrative district should be organized unless it is done voluntarily by the irrigators themselves on their own initiative and vote.

If this plan be followed, every drainage basin, every irrigated community, every canal system, and the whole body of irrigators on any stream controls its or their own affairs. They can then deal with the national government as a unit to secure the construction by it of either reservoirs or canals; they can guarantee the government the return of its investment; they can adopt any rules and regulations desired or approved by the Secretary of the Interior, and all this can be done without any necessity for a complicated code of state laws.

No man can tell in advance what statutes may be needed. If we are let alone, then, as communities are created or plans made for building new systems, either by governmental or private enterprise, statutes can be enacted when necessary to meet the local needs as they arise. The development of the laws of irrigation in every state must be a gradual evolution, following rather than preceding the practical experiences of the irrigators themselves.

The first task before us is to overcome this movement, which has now attained too much headway, in favor of the adoption of these complicated codes of water laws in every state. We do not want them. They would complicate and retard beyond calculation the operations under the national irrigation act.

WHAT STATES SHOULD DO.

There are things that the states ought to do, but those things are not the adoption of complicated codes of water laws. The states should establish a few simple fundamental principles by constitutional amendment and judicial decision. It cannot be done by statutory enactment.

Every state should adopt a constitutional amendment to the effect that the right to the use of water for irrigation vests in the user and becomes appurtenant to the land irrigated, and that beneficial use is the basis, the measure, and the limit of all rights to water.

In every state, in addition to this con-

stitutional amendment, decisions should be had in the supreme court of the state establishing this to be the law, and also establishing the doctrine that this same rule of beneficial use applies to the rights of a riparian owner as well as to the right of an appropriator. It is the law of our entire arid region, when correctly interpreted, and should be clearly so declared by our courts, that a riparian owner cannot prevent by injunction a diversion from the stream above him, unless it interferes with some beneficial use of the water then being made by the riparian owner.

It should also be established by our courts clearly and beyond question that the right of a riparian owner to use water to irrigate land to produce crops, as we understand the meaning of the term irrigation in the arid region, is not a common-law right, but one growing out of the necessities of this arid country, and that the riparian owner's right to the use of water for irrigation arises from necessity and is based on and limited by use. It is not perfected until the water has been actually used, and therefore if an appropriator perfects a right by use on the stream below the riparian owner before the riparian owner uses the water, the right of the lower appropriator becomes a vested right which the upper riparian owner must respect, and the riparian owner cannot afterward take the water away from the lower prior appropriator.

These are matters which must be adjudicated by our courts, who have jurisdiction to determine not only what the rights of riparian owners now are, but to find what they have been in the past. If these rights are thus limited by judicial decision, the decision is not an interference with any vested right. It is merely a determination of what that right is and has been and fixes its limitations.

COÖPERATIVE CANAL COMPANIES.

Every one planning the organization of a canal should be shown that water-right companies have been the graveyard of millions of dollars invested in them, while coöperative canal companies have been almost uniformly successful. In organizing irrigation companies, promoters should sell stock and not water rights, putting their profit on the price of the stock. Then when the investors have got back their money and their profits, the ownership of the system goes to the land-owners, who should control and operate it for their common benefit. Not another water-right company should ever be organized, and all now existing should as rapidly as possible be transformed into land-owners' companies.

AN EDUCATIONAL CAMPAIGN.

To make all these matters generally known and understood requires a great and persistent educational campaign. It can only be carried on by an organization like The National Irrigation Association, having a fixed policy and a permanent membership and an adequate fund for conducting the campaign by public lectures and the distribution of printed matter and information through the press. This cannot be done by an organization like the National Irrigation Congress, which is a mere forum for discussion, having no policy whatever about anything.

The work that has been done in the last three years to convert the east through our educational campaign has been done by The National Irrigation Association—not by the Irrigation Congress—and this association will continue its work. The association now has a national membership which is steadily growing, and it should never in the future be confused with the Irrigation Congress, which is a distinct and separate organization—merely an annual convention for the discussion of irrigation topics and the passage of resolutions, which may advocate one policy one year and another and different policy the next year.

The National Irrigation Association must continue its educational work in the east until eastern public sentiment will favor the appropriation of just as much money as is necessary in every state to build projects which have been surveyed and approved by the Secretary of the Interior. The arid lands should

be reclaimed just as fast as settlers will take the land and pay back to the government the cost of the irrigation works built for their reclamation. This and the merit of each project, and nothing else, should be the test of whether any given project should be built. Unless we can establish this broad policy as the policy of the national government, the result will be that at the end of a couple of years the western states will inevitably be fighting among themselves for the small sum of $2,000,000 or $3,000,000 a year, which is all that will be available under the present act.

In the next two years there will be about $10,000,000 available for construction, because we started with a fund of nearly $6,000,000 when the bill was passed. This fund of $10,000,000 is as much as can be wisely expended during the next two or three years.

It will be enough to build a few great reservoirs and main-line canals as object lessons to prove the truth of our claims to the eastern people of what can be accomplished by national irrigation. It is not material where these projects may be located. Our association will back up the Interior Department in any selection they may make. But the people of any section of the west who unite their forces can do much to promote the construction of any particular project if it possesses every merit and promise of success.

I would urge the organization of a section of The National Irrigation Association in every city and town in the west to study and to teach the true principles of this whole irrigation propaganda.

It is not limited to governmental construction. It covers the whole field of private irrigation enterprise; of the organization of water companies; of the betterment of our laws of water along right lines; of artesian development and of pumping for irrigation from every underground source.

And last, but not least, it takes in the whole field of forestry. The bleak plains of western Nebraska should be dotted with forest groves planted by Uncle Sam. Every farmer should be induced to plant trees, and then to plant more trees The children in your schools should be taught to love the trees and to preserve those we have, and plant more every year, until the whole State of Nebraska is dotted all over with groves of beautiful trees.

THE MESQUITE: A DESERT STUDY.

A DESCRIPTION OF THE HABITS AND USES OF A VALUABLE TREE OF THE SOUTHWEST.

BY

S. J. HOLSINGER,

GENERAL LAND OFFICE, DEPARTMENT OF THE INTERIOR.

ONE of the most perplexful questions in Arizona is the proper classification of the Mesquite, *Prosopis juliflora*. The Supreme Court of the Territory in 1897 decided that this hardy pioneer of the desert was not "timber," in the meaning of the United States Statutes, and was not entitled to the protection afforded by the public timber laws.

Some of the judges went so far as to declare that this tree was not a tree at all, but a recumbent shrub. From this one judge dissented. Not satisfied with this decision, the Commissioner of the General Land Office directed that a test case be prepared, and if necessary an appeal be carried to the United States Supreme Court. However, the territorial courts modified the former decision, holding that the question as to whether Mesquite was timber was one

of fact and not of law, and a proper subject for a jury to pass upon in each particular case.

Not only have the doctors of law disagreed, but even the professional botanists have become bewildered and have attempted to estrange the members of this interesting family into two species, making no concessions for, as I believe, the multiform varieties of growth, due to difference of environment.

Professor Wooten has classified this plant as *Prosopis juliflora* and *Prosopis velutina*, the latter being an arboreal form of the Mesquite. This classification may be necessary, but it seems to me there is only one variety, and that the difference mentioned is due entirely to locality, soil, wind, and various other conditions, and not to difference in the organic species.

There is unquestionably a tendency among botanists to carry classification too far—so far, in fact, that if a distinction does exist, only a study of the plant by an expert can detect the dissimilarity.

These controversies have been enough to discourage a less tenacious and persistent representative of the vegetable kingdom; but the Mesquite has continued to flourish despite drouth, failure of appropriation for irrigation, and in the face of adverse judicial decisions. On the Colorado it has attained a height of 35 feet, 35 feet on the Verde, and in some instances 65 feet on the Santa Cruz River near Tucson, Arizona, with many other instances of similar growth throughout Arizona and New Mexico. It also continues to receive due recognition as the principal fuel of the territory, notwithstanding the ban placed upon it, and gives warmth alike to the just and the unjust.

Under the most favorable conditions, which are found on the higher well-drained bottom lands, it attains a large size, ranging from 18 to 30 inches in diameter. Under such conditions it accumulates in its wide-spreading branches large quantities of fuel timber, ranging from a few hundred to as many as 1,000 cubic feet.

As an economic plant the Mesquite has not received general recognition beyond fuel and for fencing, although it also enters largely into the construction

MATURE MESQUITE TREE ON VERDE RIVER, MARICOPA COUNTY, ARIZONA.

SHEEP FEEDING ON MESQUITE BEANS.

of native houses. Almost all of the Spanish residents of Arizona and New Mexico have used Mesquite in their buildings. It is also used by the Indians in the construction of their tepees, hogans, huts, and lodges, or wherever it can be obtained.

The wood has a close, hard grain, and a specific gravity greater than oak. It weighs 3,000 pounds to the cord, and one cord is equal to something over one ton of coal. The heart wood has a deep, rich brown color, similar to walnut but brighter. It admits of a fine polish and would make beautiful veneering. The sap wood is white, with a tinge of yellow when seasoned.

As an ornamental or shade tree, the Mesquite has been neglected, possibly because it is a slow grower and also because it is difficult to transplant. Naturally it is a handsome tree. In form it is not unlike a fruit tree, especially the large and prolific growing varieties of the apple. The mesquite groves on the river bottoms often closely resemble the old apple orchards of New York. The branches are strong, yet supple and yielding; the heavy foliage of pinnated, decompound leaves are moved by the slightest breeze. The natives believe that there is something about the mesquite leaf which cools the atmosphere, and they speak of the "cool shade" of that tree as a distinctive and marked characteristic. This hallucination is due to the structure of the leaf. The leaflets are suspended upon a small stem, allowing them to turn with the slightest movement of the atmosphere. The flexibility of the branches, with the form of the leaf described, permits the easy passage of the breeze through the heavy foliage and yet does not destroy the shade; hence "the cool shade of the mesquite tree."

The plant is very tenacious when grown from the seed. It sends down long, slender rope-like roots, which penetrate the earth to great depths, in consequence of which it is able to flourish when there is no moisture on the surface. It also has the quality of adapting itself to a wide range of conditions of climate and soil. From this fact has originated a popular belief that there are many different varieties of Mesquite. If the seed falls in deep, rich soil, with abundant moisture within

10 to 30 feet of the surface, it grows to large size. If the locality is protected from heavy winds the tree grows erect, but with a wide spread of branches. If the locality is swept by strong breezes it takes a wider spread or arboreal form, the secondary trunks trailing on the ground. If the prevailing winds are heavy and frequent the stems often grow along on the surface, one tree forming what appears to be a great mesquite thicket.

be said that the sand covers the tree rather than that the tree grows under the sand. But this same form of mesquite growth is found near Wilcox, Arizona, in the Sulphur Spring and in Aravaipa Valley, where there is no sand-drift, but heavy winds. Here the trunks grow entirely under the ground, where the land is comparatively level, only a slight mound and an abundance of foliage indicating the hiding place of the freakish Mesquite. This character-

COPPICE REPRODUCTION, TWO YEARS' GROWTH, PINAL COUNTY, ARIZONA.

This form of growth is of pronounced type on the Gila River near Buckeye, Arizona. Where the wind reaches the velocity of a gale and sandstorms are common the tree fortifies itself against the relentless blasts by taking refuge beneath the surface, as on the Salton desert in California, where the entire trunk is covered, only the small shoots appearing above the sand. Thus it forms large sand-mounds, which are excavated by the woodman. Some of these mounds, representing a single plant, yield from one-quarter to three cords of wood. In this locality it may

istic is in part responsible for the origin of the expression, "Dig for wood and climb for water," in Arizona.

The tree has other values than that of fuel, fencing, and building purposes. It is the manna of the desert, the bread-tree of the southwest. Mesquite beans, doubtless, have formed the staple food product among the American Indians of the arid regions during many ages. It is the nutritious pods more than the beans which are relished and used by the Indians. The pods are ground in a stone mortar or upon flat grinding stones to the uniformity of a meal, the fiber of

the pods and hard seeds being winnowed. From this meal a palatable mush and cakes or bread is made. The bread will not mould or harden, and will keep for months. In Mexico the natives carefully select the pods from trees which bear fruit, having a flavor suited to their taste. What is made from these, either into cakes or gruel, is considered a great delicacy among them and is known as "péchitas." Parched, it forms a substitute for coffee.

The notorious "tiswin," the use of which, by the Indians of the southwest, the government has tried to suppress during many years, was usually made from mesquite beans. The Apache warrior imbibed freely of this, his favorite beverage, relying upon it to stimulate him to not only deeds of valor, but cruel torture and even murder.

The beautiful olla basketry so much sought after by eastern tourists and curio hunters are tiswin jugs. In these large ollas the pulp of the bean-pods are covered with water and there allowed to ferment and thus is brewed a drink, which is said to contain all of the devilish characteristics of beer, wine, and whisky of more civilized concoction.

Every stockman in mesquite countries figures on the bean crop as an important forage. Cattle and horses grow fat on it and his profit or loss depends, in many localities, upon its success or failure. The beans are often gathered and stored, ranchers preferring them to oats or barley.

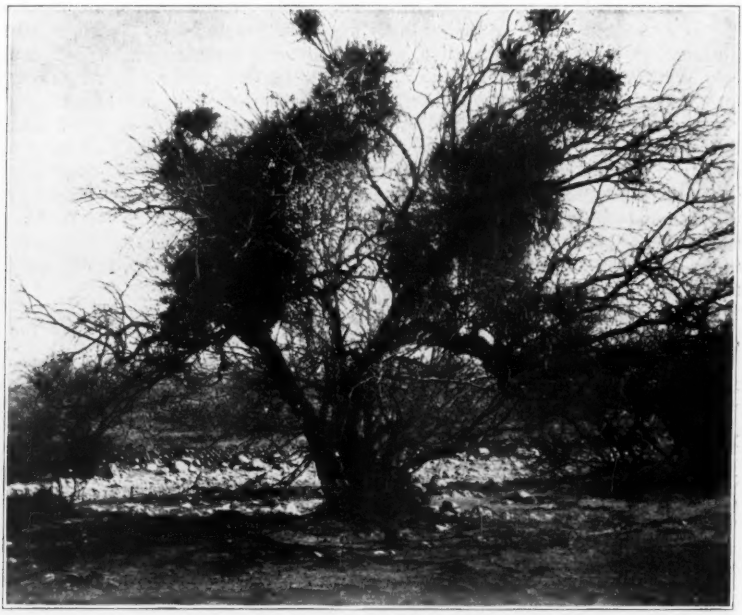
The tree usually produces two crops, the first ripening during July and the second in September. In Mexico there is often a third crop. The leaves also form a valuable forage, and the budding mesquite thickets in April and May frequently afford the only sustenance for thousands of emaciated cattle. It is not unfrequently the only safeguard against starvation where summer rains fail and there is no grass. Stock do not thrive upon the leaves alone, but the bean crop may usually be relied upon to prepare them for the market.

The bark of the tree contains a high per cent of tannin, but on account of the difficulty of removing the bark and its small body it has never been used except by the natives. A gum forms on the branches which makes a fine mucilage, and this in a small way is made a commercial article in Mexico. It is used by the Indians to fasten sinew upon their bows, thus giving them strength and elastic coil. It is also used for mending pottery and various other purposes. From the sap an indelible black dye is made, which is used in preparing material for blankets, baskets, and decorating pottery.

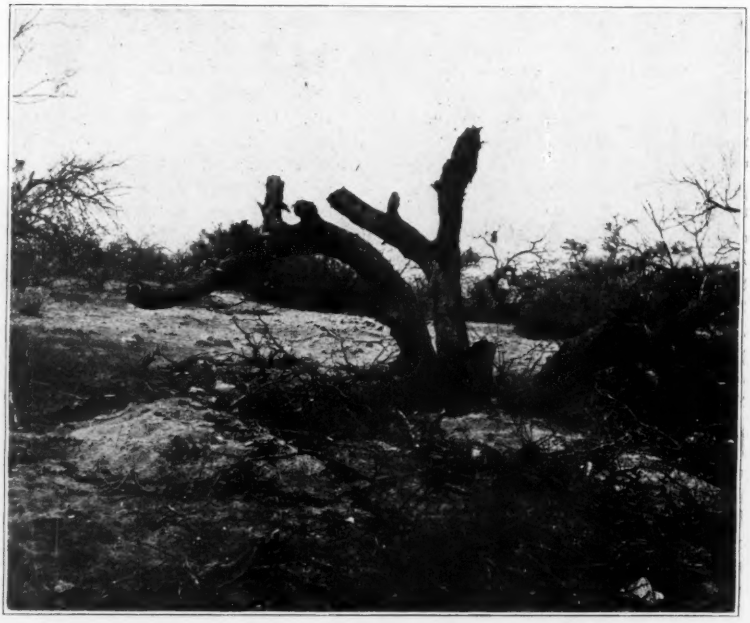
Enough has been said to show that the mesquite tree is a very valuable plant, and that it will bear a closer acquaintance. Doubtless experiments will develop new characteristics and new values, and that it will at no distant date occupy its proper position in the list of economic plants.

Pages might be written concerning the value of this tree as a stay against erosion. Its long roots sink deep into the earth and bind the loose detritus, soil, and silt in canyons, wash, and valley, where, without such protection, would be only boulder fields. In this respect, unaided by cultivation, it surpasses the willow and cottonwood, its rooting being deeper and stronger. It is a long-lived tree, specimens examined in Mexico and near Tucson, Arizona, showing as high as two hundred annual rings. The life of the tree under ground is from 20 to 40 years, and above, exposed to the weather, 50 to 75 years.

Coppice reproduction or regrowth from stumps left in harvesting the wood is comparatively rapid and sure. The second growth is a better class of wood, and matures in from ten to twenty years. Having a large, vigorous rootstalk, coppice is formed from supernumerary buds, and thrifty, strong shoots are thrown out. As with closely pruned fruit trees, the second growth is much straighter than the original growth, and consequently more valuable. It is this class of wood which is in great demand for fence posts. The seasoned wood has an enemy in a common beetle, the larvæ of which eat their way through the hardest specimens. The work of the beetle may be circumvented by charring the timber soon after felling.



DESTRUCTION BY A PARASITE IMMINENT UNLESS RELIEVED BY THE WOODMAN'S AXE.



MESQUITE TREE AS CUT BY MEXICANS. A FAIR PRUNING FOR FUTURE GROWTH.

The distribution of the plant embraces a territory described by Swartz, extending from "the southern border of the Indian Territory, northern and western Texas (the eastern limit defined by a line from the intersection of latitude 37° with the 100th meridian to Dallas; thence south to the Colorado River and southwestward within 20 or 30 miles of the Gulf, which is reached near the mouth of the Rio Grande River) into northern Mexico. Also from the southern borders of Colorado and Utah, through New Mexico, Arizona, and southern Nevada to southern California, the western limit defined by a line from Tejon Pass over Los Angeles to San Pedro; in lower California; western South America (Andean region to Chile); Argentina and southern Brazil and Jamaica."

The screw-bean or *Prosopis pubescens* is a variety of the Mesquite. The seed pods or beans are twisted into spiral, cylindrical-like receptacles which hang in clusters. The utility of the tree is similar to that of the *Prosopis juliflora*, and the pods are also considered very nutritious. Mexicans call the tree *tornilla*, and it is found in Mexico and from New Mexico to southern California.

TREE GROWING IN NEBRASKA.

A DESCRIPTION OF THE GREATEST UNDERTAKING IN THE TREE PLANTING LINE EVER ATTEMPTED IN THIS COUNTRY.

BY

DR. CHARLES E. BESSEY,

PROFESSOR OF BOTANY IN THE UNIVERSITY OF NEBRASKA.

I WAS fortunate enough not long ago to receive an invitation from the officers of the Bureau of Forestry to visit one of the forest reserves in Nebraska. As is now generally known, two considerable tracts of land in Nebraska were set aside last spring by President Roosevelt for forest purposes. One of these is in Thomas county and extends from the Dismal River on the south to the middle Loup River on the north. This one contains about 86,000 acres, and is called the "Dismal River Forest Reserve." The other reserve is in Cherry county, and extends from the Niobrara River on the north to the Snake River on the south. It contains about 126,000 acres, and bears the name of the "Niobrara Forest Reserve." There are then about 212,000 acres of land in these two reserves—an area equal to about nine townships, or say about half of an ordinary county in eastern Nebraska. On both reserves there are some native trees growing along the rivers, but for the most part the country is a great rolling surface of sand-hills. In fact, it was the purpose of the Bureau of Forestry, as far as possible, to select only sand-hill land for these reserves.

Ten or eleven years ago the Bureau of Forestry made an experimental planting in the sand-hills of Holt county, and to-day the pine trees in that plot of ground are from sixteen to eighteen feet high, and growing vigorously. In fact, these Pines have grown faster than similar ones planted at about the same time at Lincoln. The result of this experiment has been another of the surprises that the sand-hill country is in the habit of making from time to time. Few people had faith in the ability of the sand-hills to grow pines, but no one who has seen this experiment now doubts that it is possible to make trees of this kind grow well in the hills. One good experiment like this is worth a great deal of theorizing.

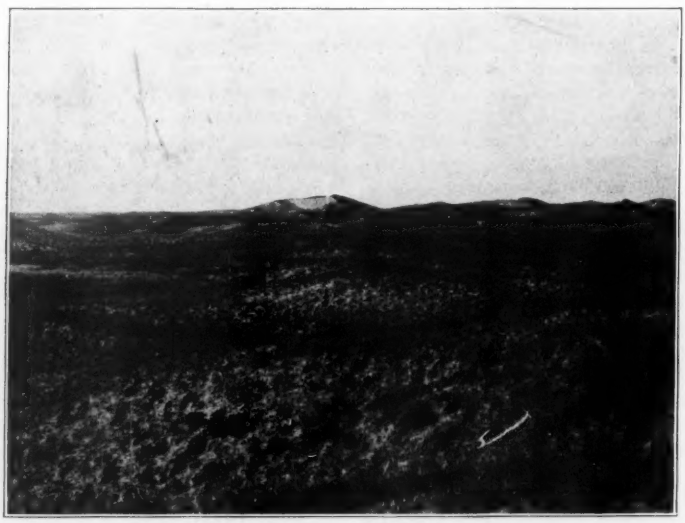
The Dismal River Reserve is triangular in general outline, its western border

running south along section lines from near Thedford to the Dismal River, where the line turns at a right angle and runs east for nearly twenty miles, following the general course of the river. It then zigzags northwest, following the section lines along the middle Loup River to the starting point near Thedford.

The village of Halsey, about midway on the diagonal side, has been taken as the point near which to begin work. At this place I was met by Mr. Miller, who is in immediate charge of the work. We mounted our horses, and first fording the river rode to the camp, two miles away, at the foot of a bluff. Here there were several tents, a cooking outfit, teams, wagons, tools, etc., and half a dozen men. The latter were young fellows, all college graduates, who have entered the Bureau of Forestry after completing a course of scientific training.

We soon started out for a preliminary survey of the premises, stopping first at the nursery site. Here the ground has been cleared and plowed and workmen were engaged in putting in the posts for the inclosure. A thicket of trees and shrubs near by receives a good deal of attention, since here in the space of a few rods no less than twenty-four different species of woody plants are growing naturally. This is in itself an indication of the favorable location of the nursery. We then scrambled up the bluff, past indications of a couple of strong springs which are waiting to be opened for the use of the workmen. On the bluff we found that some trees have grown to the very top. Most of them have been cut by settlers, who paid no attention to the fact that they were the property of the government. There is evidence that some of the red cedar trees were nearly two feet in thickness. There are now small Red Cedars on the hillsides, where they make a thrifty growth. On the bottom land close to the river we found a thicket of shrubs growing as rampantly as in New England. Here, too, we found a rank growth of ferns. In fact, I do not recollect to have seen a greater mass of ferns anywhere in Nebraska.

After dinner in camp we got into a light buggy, behind a span of government mules, and drove directly into the sand-hills We followed no road or trail. In fact, there were none to follow. The surface is very irregular and broken, and the drive was one of the roughest that I have ever taken. We drove for many miles over the hills and



A SCENE IN THE SAND-HILLS OF NEBRASKA, SHOWING PRESENT ABSENCE OF TREES.

PINE TREES GROWING IN THE NEBRASKA SAND-HILLS. THIS PLANTATION BEGUN BY U. S. DEPARTMENT OF AGRICULTURE IN 1890. SOME OF THE TREES ARE NOW 18 FEET TALL.

through the valleys. At every point the question was asked whether trees will grow or not. It is noticed that although the hills are of sand alone, there is an abundance of moisture a short distance below the surface. Even in the "blowouts," where the bare sand is so dry that it blows constantly, we had to dig not more than three or four inches in order to find sand so moist as to be easily squeezed into "forms" in the hand. Every grower of plants knows that such soil is moist enough to grow trees. Here and there we found clumps of hackberry trees, and in nearly every valley there are plum or cherry thickets. All over the hills we found innumerable low shrubs of the Sand Cherry, Prairie Willow, and Red Root.

After a drive of fifteen miles we came to the river again and rode rapidly to Thedford, for the evening was cold, and, besides, we were very hungry.

Next morning we started early and drove southward along the western boundary of the reserve, following the traveled road. Here the surface is more closely sodded and the settlers are making hay from the rich grasses which cover the surface. We drove into the reserve at a couple of points and found the sod more open and better adapted for tree planting. The hills here are in distinct ranges with broad valleys between. We crossed the hills through passes, and then wound across the undulating valley. Here there were thousands of cattle and we realized that we were in the region of the great cattle ranges.

At noon we reached the Dismal River, which we forded in our search for a convenient place for our noon camp. We found a spring, at which we satisfied a prodigious thirst, and ate our luncheon, while Uncle Sam's mules were assimilating corn. We climbed the bluffs on the south side of the river and got a view such as is seldom seen in Nebraska. Below us two hundred or more feet is the Dismal River, bordered with veritable marshes; westward we looked up the river, bordered for the whole distance with marshes like those nearby; eastward the picture is of a valley with bordering hills, while through it meanders the marshy river; northward are the sand-hills, ridge on ridge, stretching away as far as the eye can reach. Thousands of cattle could be seen taking their slow course toward the river for water. It was a peaceful sight, but it is strange

in this, that no human habitations are to be seen. One could easily imagine himself in a country not yet inhabited by man.

Shortly after one o'clock we were again under way. We forded the river again and drove for miles down its beautiful valley. We noted the strong growth of trees on the river bottom and the bordering hillsides. Here again the Red Cedars are to be seen growing vigorously, and here also the large trees have long since been cut and taken away. We forded again a few miles down the river and noticed that the volume of water had perceptibly increased. These rivers of the "Loup system" are the most remarkable in North America, if not in the whole world. They flow from a sand-hill country which has a dry surface and a limited rainfall. They have few tributaries, and in some cases none at all for a great many miles. They never run dry, and they never rise or have "freshets." If one gauges a stream like the Middle Loup or the Dismal at some point, and then goes down fifty miles or so, he will find that there is more water in it, even though it has received no tributaries in that distance. What is the secret of the Loup rivers? They are spring-fed streams. They receive practically no surface water. All the rain that falls in the sand-hills is absorbed by the porous soil and allowed to trickle down slowly to the lower and less pervious layers, where it appears in the form of numberless springs. This is the secret of the steady flow of the Loup rivers, of which the Dismal is perhaps the most remarkable.

Down the river we went, at last obliged to leave the valley and drive over the bordering low hills. We kept along the southern edge of the reserve for its whole distance and at last passed its southeast corner. It was now late in the afternoon, and we were tired and hungry. We drove rapidly now, and by 7 o'clock came to the village of Dunning, where we found food and lodging. Here our present study of the Dismal River Forest Reserve ended.

I promise myself the pleasure of another visit to this reserve within a year or two, after some of the work which has been projected has been done. I would suggest, also, that this reserve should be visited by the many Nebraskans who are actively interested in the work of tree planting. It is to be the greatest undertaking in the tree planting line that was ever attempted in this country. On this account it is worth visiting, if on no other.

NEW FOREST AND WATER ASSOCIATION IN NEW YORK.

TO ENCOURAGE AND PROMOTE PRACTICAL FORESTRY, WATER STORAGE, AND THE DEVELOPMENT OF NATURAL RESOURCES.

THE Forestry, Water Storage, and Manufacturing Association of the State of New York is the title of a new organization which was formed as a result of a recent meeting of manufacturers held in New York. This new association is the outcome of a general feeling among the people and manufacturing and other industrial concerns having interests in the Adirondacks, and along power-producing rivers that originate in the Adirondacks, that a great deal for the mutual benefit could be accomplished by concerted action.

The object and purpose of the formation of the new association, according to the articles adopted, are as follows:

"To encourage and promote the building and maintaining of water-storage reservoirs in the State of New York for the purpose of checking freshets, maintaining a more uniform flow of water in rivers and streams throughout the year and rendering and making them

more useful in the transportation of the products of the forests and mines and the development of the material resources of the state, and for other beneficial and lawful purposes.

"To promote and encourage a proper and practical system of forestry and unite in all reasonable and honest efforts therefor. To discourage by education and other proper means the removal of timber from lands in such manner, and to such extent, as will render such lands useless for the further growth of timber, and to encourage under safe and proper limitations the removal of grown timber from all lands in the State of New York.

"To encourage in such way as may be desirable the rendering of rivers and streams of the State of New York more available and adaptable for use by manufacturing and business interests.

"To encourage the development of our natural resources for the storage of water."

It is not intended to confine the membership to industrial concerns, as shown by the following qualifications for membership: "All persons, associations, partnerships, and corporations who are subscribers hereto and such others as from time to time shall be elected by the executive committee of the association will be members of this association." The principal office for the association is to be in Albany, N. Y.

The organization was perfected, articles of association adopted, officers elected, and committees appointed as follows:

President, William McEchron, a retired lumberman; vice-president, Theo. Basselin, of the Beaver River Lumber Company, Creghan, N. Y.; second vice-president, E. L. Ashley, an attorney of Glens Falls, N. Y.; secretary, John C. Durgin, manager of the woodlands department of the Union Bag and Paper Company; treasurer, Jere. T. Finch, a lumberman of Glens Falls, N. Y.

Executive Committee—G. F. Underwood, manager of the woodlands department of the Union Bag and Paper Company; G. P. H. Gould, of the Gould Paper Company, Lyons Falls, N. Y.; Geo. C. Sherman, of the St. Regis Paper Company, Watertown, N. Y.,; George Chahoon, of the J. & J. Rogers Company, Ausable Forks, N. Y.; Geo. W. Sisson; of the Racquette River Paper Company, Potsdam, N. Y., and L. W. Emerson.

Finance Committee— Herbert G. Aldrich, of the Aldrich Paper Company, Natural Dam, N. Y.; O. H. Tappan, a Northern New York lumberman; Loren Allen, of the Allen Brothers Company, Sandy Hill, N. Y.; John H. Derby, a Sandy Hill lumberman and papermaker; James MacNaughton, of the MacIntyre Iron Company, New York, and John C. Duncan, of the Duncan Company, Mechanicville, N. Y.

Legislative Committee — Frank L. Bell, an attorney, of Glens Falls, N. Y.; Patrick Moynehan, representing William C. Whitney; Geo. N. Ostrander, of the Racquette Falls Land Company, Albany, N. Y.; Curtis N. Douglas, a northern New York lumberman, and J. P. Lewis, of the J. P. Lewis Company, Beaver Falls, N. Y.

Those who attended the meeting control several hundred thousand acres of timber lands in the Adirondacks, as well as most of the paper mills and lumber industries located upon the rivers which rise in the Adirondacks.

While there are already in existence a number of organizations representing interests, commercial and otherwise, in the Adirondacks, and whose objects are in general to promote the interests of both the members and the public at large in the Adirondacks, there is none that represents anywhere near so vast an amount of capital or such varied interests as the Forestry, Water Storage, and Manufacturing Association of the State of New York.

The consensus of opinion at the meeting was that the public at large does not understand that the owners of great industrial properties in the Adirondacks are most vitally interested in carrying out the purposes as set forth by the articles of association adopted.

It is felt that as this association is composed more largely of practical men than any other organization it will be able to supplement what has already been accomplished toward improving and preserving the great natural resources of the state, both in water and timber lands.

THE BEETLE PEST IN THE BLACK HILLS FOREST RESERVE.

AN IMMENSE AMOUNT OF VALUABLE TIMBER DESTROYED—METHODS TO PREVENT FURTHER DESTRUCTION.

BY

FILIBERT ROTH,

CHIEF OF THE DIVISION OF FOREST RESERVES, DEPARTMENT OF THE INTERIOR.

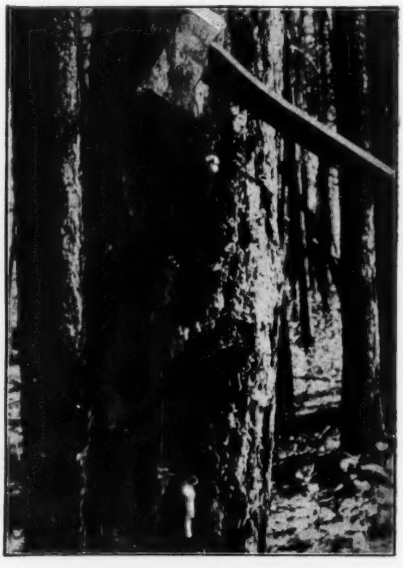
AS is well known, the Black Hills forest forms an elevated forest island in the midst of the Great Plains. Its value, therefore, is very great, even if viewed merely from the standpoint of timber supply, and this is materially increased by the presence of large and valuable mining interests within the forest itself.

At present these mining districts form the principal market for the timber of this reserve; shipment to other parts of South Dakota (in which state nearly all of the reserve is located) are too roundabout to permit of profitable exploitation, and shipment beyond the state is prohibited by law. The reserve has an area of about 1,200,000 acres, and is more hill than mountain land. The forest is composed almost entirely of Western Yellow or Bull Pine (*Pinus ponderosa*), with patches of spruce in particular localities.

Rough estimates place the total amount of standing timber at from 2,500,000,000 to 4,000,000,000 feet. Prof. H. S. Graves, in his report of 1897, places the total amount of material at 1,442,000,000 feet of saw timber and 13,150,000 cords of other material, apparently making about 5,000,000,000 feet of timber better than fuel and about 6,000,000 cords of fuel material.

The present annual consumption is estimated at about 20,000,000 feet of timber, but probably exceeds this amount. However, the excellent reproduction and growth of the pine in nearly all parts of the forest would justify even an increase in the exploitation and use of the material under ordinary or normal conditions.

These conditions, however, have been materially disturbed. For about ten years a destructive bark beetle has steadily increased its field of activity, and today the amount of material killed or infested by this insect is believed to be from 10 to 20 per cent of the total stand, or, according to different estimates, about 200,000,000 to 600,000,000 feet of timber, besides a large amount of fuel material.



Courtesy U. S. Department of Agriculture.

PINE TREE FRESHLY ATTACKED BY BEETLES, SHOWING PITCH TUBES.

Owing to the fact that the damage occurs in isolated patches of very varia-

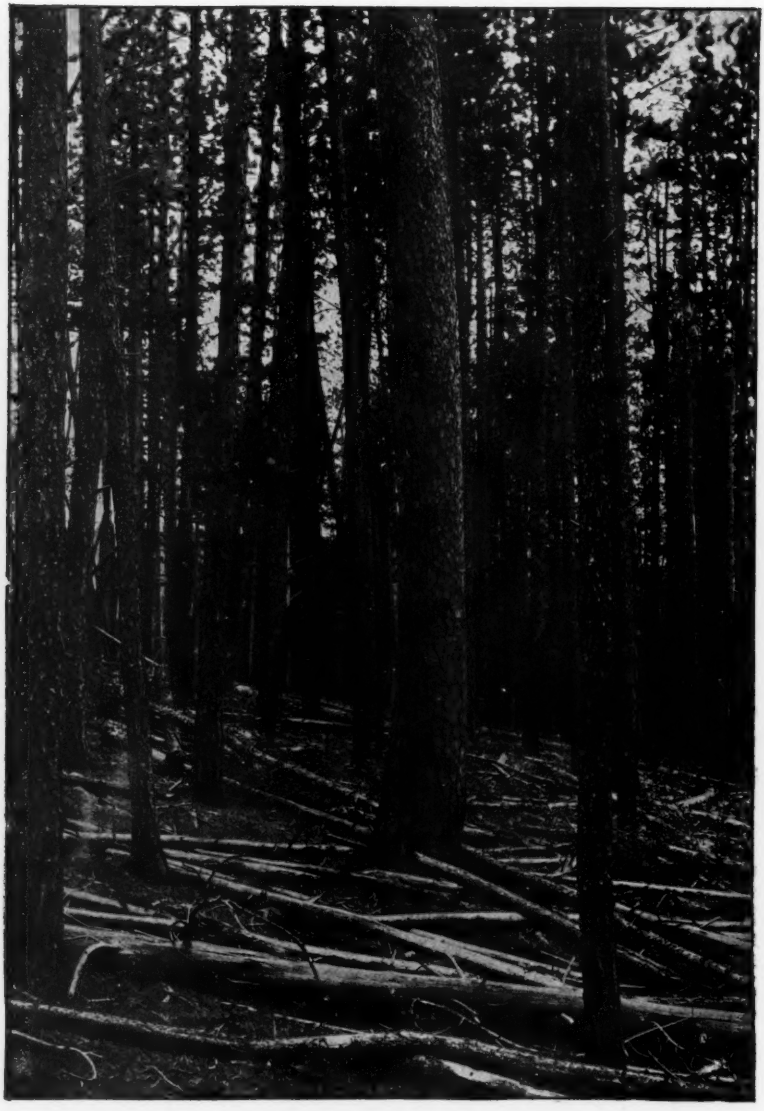
ble extent, it is very difficult to estimate exactly the amount covered by this pest, and the above estimates are largely guesswork. Nevertheless the matter is truly serious, and in some districts, particularly in the Spearfish region, large areas of forest have ceased to be green and offer only shades of red and brown, the trees over extensive tracts having been killed. According to Dr. Hopkins, the beetles attack the trees during the summer, and hibernate generally in the tender larval (grub) state and swarm the following year. The trees thus attacked remain green for some time and do not die until the year after the attack. Once attacked, practically all the trees succumb. Apparently the pest has rapidly increased in its destructiveness for a number of years, but whether it is now at a standstill or decreasing in the rapidity of its spread is uncertain. But, whether still increasing or not, there is no doubt that the beetle today is ruining timber at a rate entirely out of proportion to the growth, and, unless its work can be restricted, there is danger of the larger part, if not all, of the forest being destroyed.

Courtesy U. S. Department of Agriculture.

THIS ILLUSTRATION SHOWS HOW BARK BEETLES MARK THE SURFACE OF WOOD.

Since the large amount of dead timber remains standing and sound for some time, there is a great and constant danger of fire becoming the ally of the beetle, and thus finish whole townships in a sweep. At present the dead timber far exceeds in amount the timber infested and in various stages of injury, the two kinds comparing probably five to one.

Thus far no important steps have



VIEW IN THE BLACK HILLS FOREST RESERVE, SHOWING AVERAGE STAND OF TIMBER.

been taken to combat this beetle pest. Generally the cutting of timber is being restricted as far as practicable to beetle-infested tracts and almost entirely to timber completely killed. Since the dead timber, however, furnishes no breeding ground for the beetle, this restriction is beneficial only in so far as it affects the danger from fire, and does practically nothing to restrict the destructive insects. To remedy this matter it has been strongly recommended by Dr. Hopkins and Dr. von Schrenk, of the Department of Agriculture, as well as by Capt. Seth Bullock, supervisor of the Black Hills Reserve, that not only the beetle-killed, but also the beetle-infested (green living trees attacked by the beetles) should be included in timber sales and removed as rapidly as possible. According to these authorities, it appears that the removal of the bark during the winter season will effectually destroy the insects hibernating in the larval state, and it is believed, therefore, that the rapid conversion and removal of the infested timber will sufficiently reduce the number of insects so that their natural enemies will be able to take care of the rest. In accordance with these recommendations, the Department of the Interior has decided to allow the sales of the infested material together with the killed timber. Certain restrictive measures have also been removed, so that sales may be effected more expeditiously and the consumption of this material thereby encouraged. Unfortunately the present market is very limited, and the cutting and peeling of this timber beyond what may be sold would require an unusually large outlay of money. To enable a rapid disposition of this material it is necessary that Congress modify the present law in so far as it pertains to the shipment of reserve timber. In view of the extraordinary circumstances, it is hoped that the bill introduced for this purpose during the last session of Congress will meet with more favor during the coming session.

REPRODUCTION OF PINE IN THE BLACK HILLS FOREST RESERVE.

RECENT FOREST FIRES IN OREGON AND WASHINGTON.

DESCRIPTIONS OF RECENT DISASTROUS FIRES, WITH ESTIMATES OF THE LOSS OF PROPERTY.

BY

WILLIAM T. COX,

BUREAU OF FORESTRY.

DURING the month of September severe fires occurred in nearly every county west of the Cascades in Oregon and Washington, but the area wherein the loss of life was greatest and the destruction of timber most complete is that portion of Washington extending from Kalama River, Cowlitz county, south through Clarke and Skamania counties almost to the Columbia and east to the valley of Wind River. In Oregon the area chiefly devastated extends from the Columbia River southward, closely following the western lines of the Bull Run and Cascade Forest Reserves, through Multnomah and Clackamas counties, to Molalla River.

Some portions of these extensive areas were quite thickly settled, but the greater portion consisted of rock-strewn mountain slopes, worn into gulches and canyons by numberless clear, swift streams, and covered with a virgin forest of Douglas Spruce.

Roughly speaking, the Columbia River bisects the fire-swept region west of the Cascades. On the south side fire came down almost to the river bank. On the north side one range of hills intervenes between the burned timber and the river.

I. THE OREGON FIRES.

I will first call attention to the Clackamas and Bridal Veil fires, by which I mean that series of fires which from September 10th to 13th, inclusive, devastated Multnomah and Clackamas counties and left practically a continuous belt of charred and ruined forest from the Columbia to the Molalla River. The timber of this region is of unusual value, owing to the nearness of good markets.

Hiring a saddle horse in Portland, I went south to Oregon City, thence up the Clackamas River, traversing the worst burned districts in the vicinity of Springwater, Viola, and Dodge; then following the belt of burned country north to vicinity of Bridal Veil. Progress was necessarily slow through this section, as roads and trails were blocked by fallen timber, much of which was still burning. Bridges were burned out and streams difficult to ford.

The area burned over, while not so great as was at first reported, is very extensive. Fully 170,000 acres in Multnomah and Clackamas counties are blackened by fires. Of this area about 50,000 acres were either cut-over lands, lands that had been cleared by settlers or burned over by previous fires, and had little merchantable timber upon them.

In the Oregon fires but two people met death. These were two boys named Hamilton, who perished in the flames near Bridal Veil. Several other people are probably fatally burned and many received injury.

As near as can be ascertained, eighty-six families were left homeless as a result of these fires. Two hundred other settlers suffered a partial loss of property. The following list of farm property destroyed has been prepared after personally examining a great deal of the burned country and carefully comparing what I believe to be the more trustworthy estimates for portions not visited:

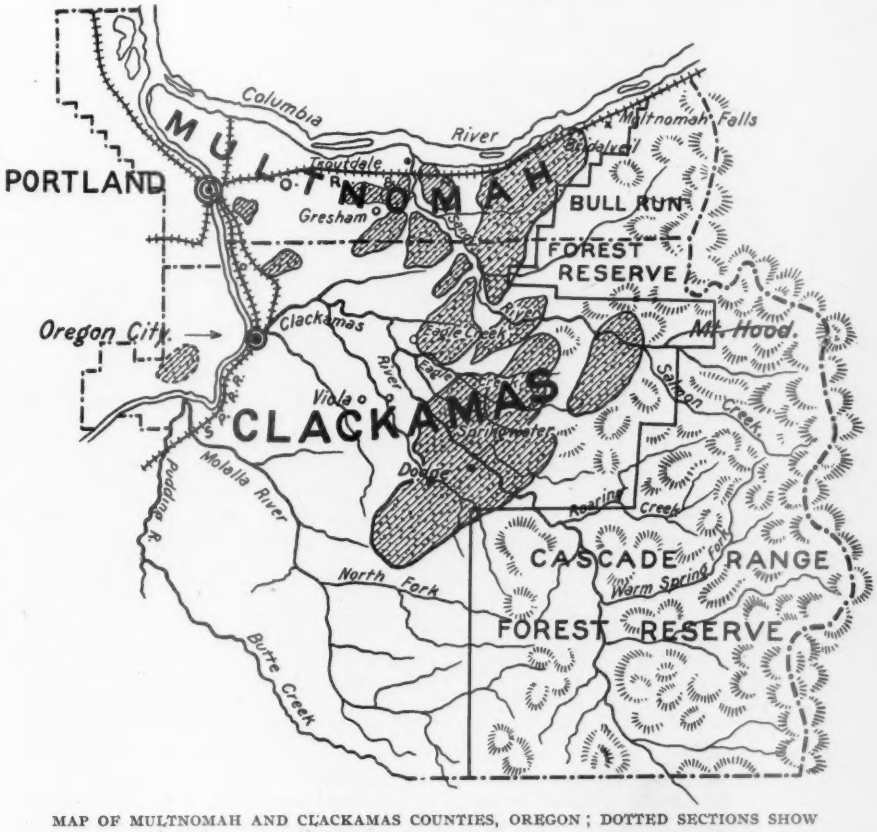
Farm buildings and furnishings ...	$115,000
Stock.	30,000
Hay and grain	45,000
Fences..	20,000
Farm machinery and vehicles	15,000
Orchards	90,000
Total	$315,000
School-houses and churches.....	35,000
Wagon-road bridges	7,000
Total	$357,000

SAWMILLS AND MANUFACTURED FOREST PRODUCTS DESTROYED.

Saw-mills	$70,000
Sawed lumber and shingles	16,000
Logs (on skid and at mills).. ..	18,000
Railroad ties (on skid and in road-bed of O., R. and N.)..	8,000
Telegraph and telephone poles (on skid)	4,000
Cordwood (ready for market)	33,000
Total	$149,000

In the dense smoke hundreds of grouse, quail, and Mongolian pheasants were surrounded by fire and roasted to death. Hundreds more had their wings scorched, and now upon the blackened forest floor fall an easy prey to prowling vermin. Large and small mammals fared no better. Carcasses of deer, bear, cougar, and lynx have been found, and thousands of dead squirrels.

It has been stated previously that fires burned over 170,000 acres in these two counties, but that cut-over lands, farm clearings, and old burns constitute 50,000 acres. It is safe to assume that the remainder, or 120,000 acres, contained 17,700 feet, B. M., per acre, or what has been considered the average for western Oregon. This is a very conservative estimate, for some districts along the



MAP OF MULTNOMAH AND CLACKAMAS COUNTIES, OREGON; DOTTED SECTIONS SHOW BURNED AREAS.

Clackamas would have yielded 8,000,000 to 10,000,000 feet to the quarter section, or 50,000 to 60,000 feet per acre. Computing 120,000 acres at 17,700 feet per acre, we have 2,124,000,000 feet as the amount of standing timber killed by recent fires in Multnomah and Clackamas counties.

The value of the standing Douglas Spruce, considering it to have been worth $1.00 per thousand, was $2,124,000. Much of this is a total loss, though a great deal will be utilized. Were the district less convenient to transportation, the loss would be much more severe. As it is, logging roads will be hastily built into the heavier timbered portions, and by rushing operations perhaps two-thirds of the Douglas Spruce will be saved.

The following list shows the losses in Clackamas and Multnomah counties:

Green and dry "Cedar" (Giant Arborvitæ)	$75,000
Tie timber	100,000
Down timber	100,000
Hemlock	50,000
Value of Douglas Spruce killed	2,124,000
Total	$2,449,000

The forest as such is practically destroyed. Upon thousands of acres not a living tree remains to seed the burned areas. In a few places enough Douglas Spruce remains to bring about reproduction, but Cedar, or more properly Giant Arborvitæ, and Hemlock, being less resistant to fire, were invariably killed. Upon the steeper hillsides and mountain slopes even the soil has been severely damaged. Particularly does this apply to northeastern slopes, where the force of the wind was greatest.

RECAPITULATION OF LOSSES.

Farm property, exclusive of timber	$315,000
School-houses and churches	35,000
Bridges	7,000
Saw-mills and manufactured forest products	149,000
Timber	2,449,000
Total	$2,955,000

While there is some government land and much that is owned by the state in the burned region, these heavy losses fall chiefly upon small private owners. Large companies had not yet begun buying up the claims. Outside of a few old settled neighborhoods, many homesteads have been taken and numerous timber claims higher up the slopes.

The past season has been one particularly favorable to forest fires. Not only was the summer very dry, but the two preceding summers were wet in May and June, thus interfering with the burning of slashings and allowing an unusual amount of debris to accumulate.

In the early part of September the wind blew from the east most of the time. An east wind, after it gets west of the Cascades, is ready to absorb almost any quantity of moisture, so that the forest was soon in the condition of tinder. When on September 10th a stiff breeze began to blow from the northeast it found a number of ground fires waiting to be fanned into something more serious.

In sections 25 and 26, township 3 S., range 5 E., Clackamas county, a fire had been burning since the first of August. Evidence points to its starting from unextinguished camp-fires of huckleberry-pickers.

Another fire had been burning in the southwestern part of township 4 S., range 5 E., in the vicinity of Dodge. This fire originated very close to the line of the Cascade Forest Reserve, and is believed to have been started by hunters, though their names cannot be ascertained. It was on August 14th that this fire was first observed by the people of Dodge. On the 20th it burned all around Myers & Sons' sawmill at that place and required fighting for two days and nights. It was believed to have been extinguished, but no one watched it, and it proved to be only smoldering. On September 12th, peculiar as it may seem, it swept back over the same area, this time traveling as a fierce crown fire and sparing nothing. The mill, together with other buildings and considerable sawed lumber and logs, was consumed, and the fire swept on down Springwater Ridge and southwest to the Molalla. A few sections on the reserve appear to have been burned over by this fire.

On September 9th a spark from an O. R. & N. locomotive set fire to the

SCENE IN AN OREGON FOREST; THE TIMBER IS RED FIR, CEDAR, AND WESTERN HEMLOCK.

dry grass and ferns just east of Bridal Veil, Multnomah county, and the fire soon spread into the heavy timber. An effort to check it was made by section men. Later a larger force was employed and the fire was thought to be under control. It did not make much headway until the high wind of the 11th and 12th turned it into a wall of flame that swept off southward to join other fires, the origin of which I have been unable to learn.

Had timely measures been taken, I feel satisfied that all of these fires could have been extinguished before becoming serious, and had there been rangers in these localities it is doubtful if any fires would have occurred, barring, of course, such accidental ones as that set by the locomotive.

Commendable work has been done by the government rangers in the forest reserves, and the absence of serious fires in them should serve as an object lesson to the states of Oregon and Washington.

The checking of the fires was brought about by the winds going down and changing to the west, which soon brought rain. Heavy rains fell throughout the burned region on September 26 and 27, eliminating all further danger.

OTHER FIRES IN NORTHWESTERN OREGON.

Tillamook County.—For a time there was great danger from the fire near Tillamook. Fire started from burning of slashings and burned three days before becoming serious. Land belonged to government and lumber companies. Companies owning timber here paid men $4.00 per day to assist in fighting the fire,—a sufficient commentary on the value of the timber. Damage, $150,000.

Benton County.—Fires near Corvallis. Damage, $180,000.

Lane County.—Fires burned for two months in the vicinity of Cedar Flat; also along Mill Creek, on the McKenzie, and between Mapleton and Florence. Origin unknown. Damage, $220,000.

Marion County.—Fire on Santiam River ruined a large amount of fine Douglas Spruce belonging to N. P. Ry. and W. V. & C. Mil. Road Co. Origin unknown. Damage, $200,000.

Clatsop County.—September 14, fire on Nehalem River destroyed a large amount of valuable Cedar and some Douglas Spruce. Indian berry-pickers blamed for leaving camp fire unextinguished. Damage, $55,000.

Total losses in northwestern Oregon, exclusive of Multnomah and Clackamas counties.	$955,000
Loss in Multnomah and Clackamas.	2,955,000
Total for northwestern Oregon	$3,910,000

II. THE WASHINGTON FIRES.

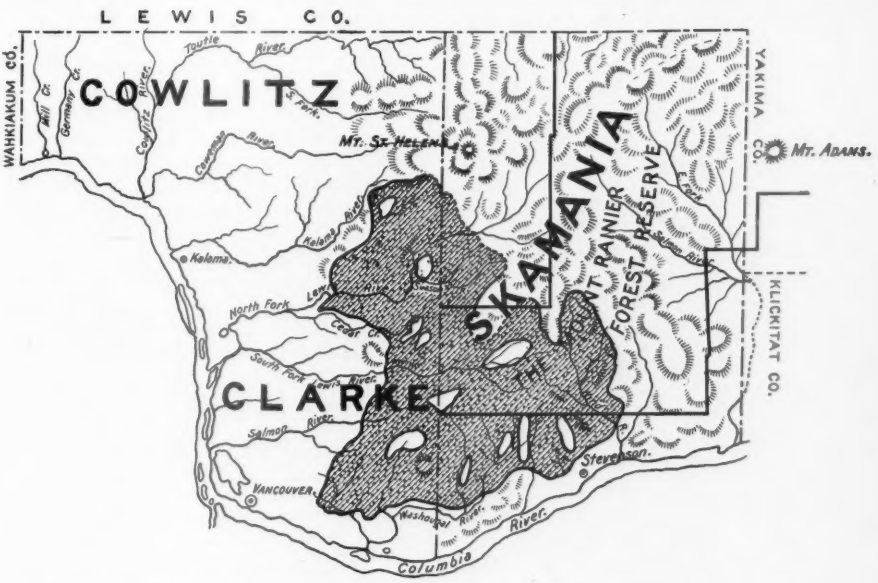
In general what has been said of the Oregon fires applies also to the fires in Washington. The area recently burned over in Washington is much more extensive than the burned district in Oregon, and the timber more valuable, but it is also much less convenient to ready means of transportation.

With the object of ascertaining the extent of damage in different localities, I hired a saddle horse in Vancouver and proceeded east to the head of La Camas Creek. From there I made my way northward as best I could, crossing the North Fork of Lewis River, and found the northern limit of the burn at the headwaters of Kalama River, near Mt. St. Helens. I visited the scene of greatest devastation on the North Fork—Speleyah Creek—where so many lives were lost. While I was at La Camas Creek flames were still busy on many logs and fire was working into the butts and roots of large trees.

AREA OF BURNED REGION.

It is difficult to obtain reliable information concerning remote districts in the mountains of Skamania and Cowlitz counties, but the accompanying map shows the area of the burned region in Clarke county with a fair degree of accuracy and approximate areas in the other two counties.

I do not vouch for the accuracy of the boundary lines of the burned districts, for of course I have not visited every township in this extensive region. Part



MAP OF COWLITZ, CLARKE, AND SKAMANIA COUNTIES, WASHINGTON; DOTTED SCTIONS SHOW BURNED DISTRICTS.

of the line was mapped in carefully, a portion was sketched in from mountain peaks, and the remainder is located from information obtained from "cruisers" and others claiming to know where the fire limit is in certain localities.

Within the area surrounded by burned timber there are considerable tracts over which fire did not run. In estimating the total area burned, all such tracts, no matter how small they were, have been deducted. Yet the number of acres actually burned over cannot fall short of 434,000, distributed in the three counties as follows:

	Acres.
Cowlitz county	104,000
Clarke county	150,000
Skamania county	180,000
Total	434,000

LOSS OF LIFE.

Where the fire swept along the North Fork of Lewis River, in Cowlitz county, it probably attained its greatest severity. This was on September 11. It was here that a party of nine pleasure-seekers, who had been camping at the foot of Mt. St. Helens, met such a tragic fate. They were driving ahead of the fiery storm in an attempt to reach Speleyah Prairie when they suddenly found the narrow road barred by fallen timber. There was no escape for them and all perished together. When found by a relief party the nine charred corpses lay close together near the irons, all that remained of the wagon. The horses had managed to get only a few steps from the wagon when they, too, succumbed.

One settler, as he left his home on the morning of September 11, told his wife that should the fires work dangerously near, she was to take the children and leave the slashing in which the house was situated and get into the green timber, where he supposed there would be no danger. She followed his advice, but this fire swept through the green timber more fiercely than in the slashings, and the fire claimed four more victims.

In all, sixteen lives were lost on the North Fork of Lewis River near Speleyah Creek. Forty more people would

surely have perished had it not been for Speleyah Prairie, which is a clover meadow one mile long and one-half a mile wide, the only opening in the forest for many miles.

FARM PROPERTY DESTROYED.

In the three counties, Cowlitz, Clarke, and Skamania, one hundred and sixty-five settlers are known to have had their homes burned by the recent fires. Hundreds more sustained some loss of property. The following are approximate losses:

Farm buildings (and furnishings)	$190,000
Stock	95,000
Hay, grain, and damage to pastures	175,000
Fences	34,000
Machinery, wagons, etc	28,000
Fruit trees	85,000
Total	$607,000

SAWMILLS AND MANUFACTURED FOREST PRODUCTS.

Sawmills	$62,000
Sawed lumber	35,000
Shingles	3,000
Logs (on skid)	24,000
Piling	4,000
Telegraph and telephone poles (on skid)	1,000
Railroad ties (on skid)	7,000
Cord-wood (ready for market)	45,000
Total	$181,000

MISCELLANEOUS LOSSES.

School-houses and churches	$28,000
County bridges	25,000
Buildings at mines	8,000
Total	$61,000

GREEN TIMBER DAMAGED.

With the exception of about 150,000 acres, all of the immense area burned over by the recent fires in these three counties is very heavily timbered. The 150,000 acres allows for all clearings made by farmers, all cut-over lands, and all old burns; also a few thousand acres of bare rock exposures on the mountain peaks. The remaining area after deducting this is 284,000 acres.

The timber here was fully as heavy a stand as the Oregon timber and of better quality; therefore we can safely employ the same factor in computing board feet; 284,000 acres at 17,700 feet per acre gives 5,026,800,000 feet as the amount of Douglas Spruce killed. That this is not too high an estimate is shown by the fact that all of townships 5 N., R. 4 E., and 4 N., R. 4 E., at the head of Cedar Creek, will average more than 20,000,000 feet, B. M., to the section. Previous to the fires timber claims in this locality were being bought up at $8,000 each. Considering the stumpage to have been worth one dollar per thousand, the total stand of Douglas Spruce killed in these three counties alone was worth $5,026,800.

The approximate values of other timber destroyed are as follows:

Green and dry Cedar (*Thuya plicata*)	$250,000
Hemlock	275,000
Larch	200,000
	$725,000
Douglas Spruce	5,026,800
Total value of standing timber killed	$5,751,800

Vast tracts are left without a living tree. Thousands of acres will soon be a wilderness of rank ferns, salal, and huckleberry bushes. In the rougher portions of the mountains burned over there are many small tracts which were somewhat protected from the wind and thus escaped complete destruction. The seed trees left upon these tracts are sufficient to bring about reproduction over much of the territory, though much of the burned country will remain treeless for many years.

Along the North Fork of Lewis River, where the fire was most severe, the soil has been left in a very loose condition and is washing badly. The humus is entirely burned off and about two inches of ashes left instead.

RECAPITULATION OF LOSSES.

Farm property, exclusive of timber	$607,000
Sawmills and manufactured forest products	181,000
Miscellaneous (schools, churches, bridges, etc.)	61,000
Timber	5,751,800
Total	$6,600,800

THE LOSERS.

On the headwaters of Washougal River private-owned timber destroyed amounts to 700,000,000 feet. Only one of the logging companies had commenced work here. Much land in this district is held by state and national governments.

Along Wind River several companies have large holdings, and there is also a large amount of state-selected land.

On the upper part of Cedar Creek and Lewis River lumber companies from Minnesota and Wisconsin had purchased large tracts shortly before the fires. As they paid from $4,000 to $8,000 for each quarter section, their losses are heavy.

The federal government and the State of Washington are heavy losers in this fire. Some of the finest timber in the west stood on the divide between Lewis River and the Kalama; also on Sucson Creek.

ORIGIN OF THE FIRES.

Fires had been burning for over a month near Silver Star Mountain, though how they started is not known. Other fires are said to have been started by careless settlers burning slashings on the lower parts of Wind River and the Washougal, near Stevenson. On Muddy Creek, a tributary of the Lewis, one fire was burning for weeks, but no attention was paid to it. These fires had been gaining headway unnoticed, for the mountains back of the first range on the west are uninhabited for many miles.

On the 8th and 9th of September fires crept out through a number of gaps in the first range from Washougal to the North Fork of the Lewis, and from that time until September 15th the settlers of eastern Clarke county and southeastern Cowlitz county were compelled to fight fire night and day.

On September 14th the wind changed and began to blow from the southwest. Rains followed on the morning of the 15th and fires subsided. On the 26th and 27th heavy rains fell, after which there was no more danger.

OTHER FIRES IN SOUTHWESTERN WASHINGTON.

Chehalis County.—On September 12 and 13 fire spread from slashings into heavy timber along Chehalis River. Sixty families were rendered homeless.

The following losses were sustained:

Farm buildings and furnishings	$40,000
Stock	10,000
School-houses and churches	10,000
Mills	68,000
Sawed lumber	20,000
Logs	20,000
Cordwood	15,000
Timber	600,000
Five trestles (N. P. Ry.)	50,000
Total	$833,000

On Hoquiam River, near Aberdeen, fire on September 13 burned over some valuable holdings of Douglas Spruce and cedar timber. It also consumed the large dam across this river. Losses are as follows:

Dam	$8,000
Mills and camps	45,000
Timber	250,000
Total	$303,000

On September 14 a crown fire swept over about half a township on Wishkaha; burned partly in an old slashing, where it is supposed to have originated; land owned mostly by eastern lumber companies. Loss, timber, $125,000.

September 14 another fire attained great headway on Chehalis River, in southeastern part of this county. Only damage was to timber, but much good Cedar was destroyed. Loss (timber, mostly owned by Seattle companies), $80,000; total for Chehalis county, $1,341,000.

Pacific County.—On September 13 and 14 a fire on Willipa River, near South Bend, destroyed some valuable timber claims, mostly Douglas Spruce timber. Value of timber destroyed, $100,000.

Wahkiakum County.—Thousands of acres near Skamokawa burned over September 12 and 13.

Willamette Pulp and Paper Co.'s mill destroyed; loss	$50,000
Timber	130,000
	$180,300

Lewis County.—September 12–14 fire raged along Chehalis River, in western part of Lewis county. Land owned by private parties, N. P. Ry., and the State. Origin of fire unknown. Loss in timber, $300,000.

Another fire of same dates, supposed to have originated from spark of locomotive, burned along track of Northern Pacific Railway near Centralis. Loss of timber, $100,000.

In the eastern part of the county, near Cinnabar, a fire burned from September 9–11. Owners of the timber burned are chiefly timber-claim settlers and Northern Pacific Railway. Loss, $320,000.

Cowlitz and Wahkiakum Counties.—(Loss listed for Wahkiakum county). A fire September 11th and 12th killed an immense quantity of valuable Douglas Spruce and some Cedar and Hemlock. The greater part of the land which was burned over is owned by large lumber companies of Portland, and mills were in operation.

LOSSES.

Camps, flume, and skid road	$13,000
Cordwood	800
House	1,500
Damage to timber	300,000
	$315,300

SUMMARY OF LOSSES, SOUTHWESTERN WASHINGTON.

Chehalis county	$1,341,000
Pacific county	100,000
Wahkiakum county	495,300
Lewis county	320,000
	$2,256,300
Cowlitz, Clarke, and Skamania counties	6,600,800
Total for southwestern Washington	$8,857,100

SUMMARY OF LOSSES IN OREGON AND WASHINGTON.

Total loss to property by recent fires in northwestern Oregon	$3,910,000
Total loss to property by recent forest fires in southwestern Washington	8,857,100
Total for both states	$12,767,100

"THE TRESPASS PROBLEM, AND HOW TO SOLVE IT."

A CORRECTION.

BY

J. S. P.,

DIVISION OF FOREST RESERVES, DEPARTMENT OF THE INTERIOR.

THE October issue of FORESTRY AND IRRIGATION contains an article on the subject of depredations upon timber on the public domain, which, in handling the subject, deals with both the cause and the cure.

The subject, when considered in either of these aspects, is a large one.

The cause, or rather the causes, that operate to induce the spoliation of timber lands throughout the entire public domain are manifold, and any discussion of the point demands a clear discrimination between the act that, on the one hand, seeks to relieve pressing need for one of the actual necessities of life, and, on the other, the appropriation of public property in the interest of individual or corporate greed and speculation, the one act to be dealt with by placing needed timber supplies within legitimate reach, and the other by making it by statute a criminal offense.

This is a discrimination vital to the question, and not to be ignored at the outset.

The article referred to fails, however, to recognize this distinction in touching, in a general way, upon what has led to the free appropriation of public timber.

Instead, it attributes the spoliation of our public timber lands to a lax appreciation, on the part of both our lawmakers and the public in general, of the fact that the act should be regarded as constituting a crime.

Several of the statements made in this connection are remarkable for presenting precisely the reverse of the facts. The following is in evidence :

"From the beginning the legal principle has been upheld—and I do not at all claim that it was a wrong or unwise principle in itself—that the unoccupied public lands are subject to utilization by whosoever chooses, unless there is a specific statute to regulate or prohibit such use This doctrine was reiterated but a few years ago by the Supreme Court of North Dakota, in the case of Matthews *vs.* The Great Northern Railway Company (72 N. W. Rep., 1085), where it is held that there is an implied license to the public to go on the unappropriated lands of the United States, pasture cattle thereon, make and dispose of hay, cut and remove timber and the like. Timber stealing from public lands, therefore, is considered by the law not as something wrong in itself, but merely as '*malum prohibitum*'—that is, something essentially innocent, which becomes wrong only because it has been expressly prohibited by statute."

The specious argument here attempted, to the effect that the attitude of the government in respect to timber on public lands implies a license to the public to go upon unappropriated public lands and remove the timber therefrom, was considered and disposed of by the United States Supreme Court in considering the case of United States *vs.* Mock (149 U. S , 273), in which Justice Brewer ruled :

"Whatever propriety there might be in such a reference in a case in which it appeared that the defendant had simply cut timber for his own use, or the improvement of his own land, or development of his own mine (and in respect to that matter, as it is not before us, we express no opinion), there certainly was none in suggesting that the attitude of the government upheld or countenanced a party in going into the business of cutting and carrying off the timber from government land, manufacturing it into lumber, and selling it for a profit ; and that was this case. . . . There is nothing in the legislation of Congress or the history of the government which carries with it an approval of such appropriations of government property as that."

The ruling of so high a tribunal would seem to have disposed of the argument finally, and since it is a most mischievous one, it becomes a serious matter to have it brought forward again, to screen offenses, by such an organ as FORESTRY AND IRRIGATION. A correction would seem to be due in the interest of the magazine.

A further misapprehension results from the following statement in the above extract :

"In accordance with this doctrine, criminal statutes against timber stealing have not usually made it a felony, punishable by imprisonment, but a mere misdemeanor, that can be atoned for by a fine, like neglect to pay a dog license.

"There can be no reasonable doubt that this attitude of the law is entirely in accord with present public opinion. The public do not look upon the trespasser as a criminal."

The exact contrary is true in respect to the "attitude of the law" on this point. As early in the history of the country as the year 1831 Congress passed an act for the protection of timber on the public lands, which was an expansion of a yet earlier act in 1817, in which it made the cutting or removing of such timber for any purpose whatsoever, other than for the use of the Navy of the United States, a felony by prescribing that "every such person shall pay a fine not less than triple the value of the trees or timber so cut, destroyed, or removed, and shall be imprisoned not exceeding twelve months." (See section 2461, U. S. Revised Statutes.)

This law remains upon the statute books, and from the date of its passage to the present time it has constituted the principal penal statute upon which the government has had to rely in its

efforts to check the waste and destruction of public timber—being the only one ever passed with the intent of being generally applicable throughout the entire country ; and, as such, it has stood for the greater part of a century as representing the "attitude of the law" towards public-timber trespassers.

More stringent and restrictive legislation could scarcely be conceived of, sparing neither fine nor imprisonment and making no distinction between the unintentional and the willful trespasser, nor between the act of the needy settler and that of the speculating corporation, but making it a crime in the case of one and all alike.

So extremely severe and so unjust in its want of discrimination has the Department of the Interior adjudged this criminal statute that it has for many years urged its repeal and recommended broader and more liberal legislation in its place. As yet, however, in spite of urgent and repeated recommendations to this effect, Congress has withstood all appeals to modify this statute.

If space admitted, it might be also shown that the article is open to criticism in its conclusions regarding the compromising of criminal proceedings. It will suffice to say, however, without further discussion of the point, that the compromise provision in the act of June 3, 1878 (20 Stat., 89), to which the article makes reference, applied only in its operation to cases which were on the court docket at the date of the passage of the act, and was limited and remedial in its scope. If it were held that it applied to all subsequent cases of timber trespass, it would simply place a premium upon such trespasses, enabling the depredators to obtain timber at the lowest rate imaginable, viz., $2.50 per acre.

The Land Department continues to recommend criminal prosecution in all cases of willful trespass on public timber.

The law does not sanction the compromising of criminal proceedings in cases in general of trespasses upon public timber. Authority for this statement is found in the opinion of the Solicitor of the Treasury under date of March 3, 1884, in which he held that "a criminal liability of this nature cannot be compromised."

A PLANTATION OF EUROPEAN LARCH

BY

AUSTIN F. HAWES.

IN view of the increasing interest in forestry, and especially in tree-planting, it seems advisable to bring to notice the present condition of plantations made some years ago, and to explain the causes of failure or the merits of the systems followed.

A small plantation of European Larch, near New Haven, Connecticut, bears instructive evidence of good intentions, but failure through a lack of knowledge of the silvicultural requirements of the species.

About twenty-three years ago a farmer of this region imported from Europe a quantity of young Larch, averaging two and one-half feet high. These were planted in rows four feet apart in each direction, on a gradual east slope. Although the importation of these young trees and the planting of them must have been very expensive, it is quite possible that had the proper attention been paid to the silvicultural requirements of the tree the undertaking might have proved a financial success.

In order to find out the contents and character of the present stand an examination of the plantation was recently made. The area measured approximately one-fifth of an acre. All the trees of the stand, and as many stumps as were still distinguishable, were calipered. Analyses were made of such

stumps as had been cut recently, and in addition the heights of fifty-five trees were recorded. Remains of sixty-seven stumps were found, ranging from one to thirteen inches in diameter, most of them being between three and ten inches.

The following table shows the number of trees of each diameter of the three classes—dominant, suppressed, and dead:

Diameter, breast high, in inches.	No. of trees.		
	Dominant.	Suppressed.	Dead.
2	..	1	2
3	..	7	..
4	8	26	1
5	24	8	..
6	38	5	..
7	27	1	..
8	9	..	..
9	1	.	..
10	3	..	..
11	1	..	..
Total...	111	48	3

A table of heights constructed by the use of a curve is given below. A great deal of variation, however, was found in the heights, seven-inch trees, for example, varying from thirty-three to sixty-two feet in height, according as they are dominant or suppressed:

Diameter, breast high. *Inches.*	Height. *Feet.*
3	32
4	40
5	44
6	46.7
7	48.4
8	49.8
9	50.8
10	51.7
11	52.6
12	53.0

From the few analyses of stumps, there seemed to be a variation in age from twenty-five to twenty-nine years, due to a difference in the time of cutting rather than a difference in the age of the seedlings. The eight stumps measured varied from 7.8 inches to 11.4 inches in diameter, and had evidently been cut for use at irregular periods without regard for the laws of thinning. The bark averaged .7 of an inch in thickness. Invariably the analyses showed the greatest growth in the middle decade of life and a rapid subsequent falling off.

To calculate more exactly the present value of the stand, the number of posts

Photo by T. S. Woolsey, Jr.

LARCH PLANTATION SHOWING THIN CROWNS AND SLENDER BOLES.

in trees of various diameters was estimated. The minimum size of a post was considered seven feet long and four inches in diameter at the small end. Multiplying the number of posts in each diameter class, both dominant and suppressed, it was found that there are approximately 320 posts, which, it is believed, is a low estimate. Allowing five cents apiece for posts in the standing trees, this would mean a total value of sixteen dollars, not allowing for the few trees which have been cut off. At this rate a complete acre would yield eighty dollars.

The large proportion of suppressed trees, these being 43 per cent of the total present stand of living trees; the decreasing rate of height and diameter growth, all emphasize the well-known silvicultural principle of the intolerance of Larch to shade. If the trees had been planted farther apart, and thus allowed space for a better crown development, the struggle for existence would have been more prolonged, and a greater accretion of timber would have resulted. The excellent natural pruning which the grove now displays might not have been produced by more open planting, but this could easily have been remedied by an underplanting of some tolerant tree, which would have served the three-fold office of pruning the Larch, protecting the soil, and producing a secondary crop of timber. The total lack of humus bears ample evidence that a more complete ground cover was needed. The growth of many seedlings and small saplings of Hard Maple, Dogwood, and Beech, which have come in naturally, show that an under story of such species is entirely feasible. Now that the trees have practically reached their height growth, a thinning would be of no appreciable value, since the crowns are too small to produce much wood, even if more light were admitted.

A more open planting in the first place, with subsequent underplanting and timely thinning, would have produced much better results than the neglectful method followed. Not only would a greater amount of timber have been produced, but it would have been of a much higher grade, for instead of deteriorating at the present time it would be improving. In thirty or forty years it would have produced a large number of telegraph poles, worth at least a dollar apiece on the stump; a considerable number of fence posts, and a supply of cordwood from the undergrowth.

THE UNIVERSITIES' INTEREST IN IRRIGATION PROBLEMS.

BY

DR. WILLIAM F. SLOCUM,

PRESIDENT OF COLORADO COLLEGE.

PRESIDENT ROOSEVELT said in his message of last December that "the forest and water problems are the most vital internal questions of the United States." With two-fifths of the area of the whole country requiring irrigation in order that good crops may be produced, we recognize the truth of this statement. We are informed that 74,000,000 acres of the 600,000,000 can and ought to be irrigated within the near future. This creates a problem which necessitates intelligent consideration and the service of specially trained engineers. The undertaking is too vast and the public interest is too great to await the action of private business enterprises. It is a matter of national concern, and the government alone can adequately handle the problem.

With the annual export of nearly a billion dollars' worth of farm products

and the business of the country adjusted to that fact, with a rapidly increasing population to be fed, with a shortage in the corn crop affecting nearly every citizen in the republic, we have come to problems which require the very best training and the most careful thought for their solution. There must be the same large grasp of the situation that the English have had in their irrigation projects, which will double the amount of arable land in Egypt, and which will accomplish more to relieve poverty in that country than has ever been done in all its history.

A careful study of the situation indicates that the colleges and universities have an important part to play in this national undertaking. The people as a whole know very little about the matter. The nation has been interested in questions which relate to the tariff, the creation of harbors, foreign commerce, and domestic manufacturing, and thus far have left this matter alone, until it is now demanding consideration. This makes it necessary that the irrigation of our large area of arid land should receive the most intelligent and scientific consideration. It is not a matter of partisan politics, but one which requires special training and careful study of the whole problem and all that is involved in it. For this reason the time has come when our colleges and scientific schools should give the subject serious consideration.

COURSES ON IRRIGATION.

It is important that our colleges should offer courses of lectures treating the subject of irrigation, including a study of all the arid districts in the United States, the problem of water supply, and the great watersheds and reservoir sites; the relation of forests to irrigation; the demand for cultivation of these lands growing out of economic conditions. Especially should such opportunities be offered to those who plan to enter public life. Every student coming out of American colleges should at least have an opportunity to learn about these matters.

Irrigation on such a scale as is necessitated by the conditions which exist in America requires great engineering skill as well as accurate scientific knowledge of the matters connected with successful farming under these conditions. There must be a knowledge of soils and their chemical changes, their enrichment by irrigation, the varying amount of water required for various crops, the matter of surface and sub-irrigation, the use of wells, the special farm products adapted to the various soils and under the varying climatic conditions. While much of this comes by practical experience, much must be done by means of careful scientific observation and study. Courses bearing upon all these should be offered in our colleges, and especially in those institutions situated in this section of the United States.

It would be well if, in addition to the work done in the law schools, the general principles of irrigation law were taught in the college department of political science.

The success of the whole irrigation scheme as a national movement will depend more than anything else upon the conservation, protection, and use of the water supply. Ultimately all the water in the arid section must be saved and used for agriculture. The accomplishment of this and the protection and development of our forests will demand well-equipped and specially trained engineers of the highest type. For these reasons our colleges must offer "irrigation engineering" courses, which shall be even better known than the "mining engineering" courses.

RECENT PROGRESS IN DENDRO-CHEMISTRY.

REVIEW OF RECENT ARTICLES IN LEADING CHEMICAL JOURNALS.

BY

WILLIAM H. KRUG,

BUREAU OF CHEMISTRY, U. S. DEPARTMENT OF AGRICULTURE.

VARIATIONS in the Occurrence of Salicin and Salinigrin in Different Willow and Poplar Barks. H. A. D. Jowett and C. E. Potter (Pharm. Journ., 1902, 69, 1677, 157–159). The glucoside, salinigrin, has previously been isolated by one of the authors from an unknown species of *Salix*. A large number of different species of *Salix* and *Populus*, both European and American, were collected and examined so as to determine the botanical source of the glucoside. Thirty-three specimens were examined and salinigrin was found in only one, *Salix discolor*, Muhl. The investigations showed that the amount of salicin present in the bark of a willow or poplar depends both upon the species, the season of the year, the sex of the tree, and possibly other factors. The quantity appears to increase in the fall, and whilst in April bark from female trees contains about three times as much as that from male trees, in July the latter yield the larger proportion, the bark of the female trees in this month being almost destitute of the glucoside.

Improvements in and Relating to the Dyeing of Timber. M. Grünhut, Vienna (Eng. Pat. 13, 118, June 9, 1902). The dyeing solution is forced into the wood by means of a pressure chamber fitted to one end of the log, the transmission of the liquor being facilitated by a suction chamber attached to the other end. The logs are first subjected to a treatment with soda lye under pressure and the dye is dissolved in a solution of alum, lactic acid, or lignorosin. Several colors may be obtained by the use of stencil plates.

The Determination of Alkali in Sulphite Lyes Containing Soda. H. Schwartz (Chem. Ztg., 26, 77, 897).

1. The alkali combined with sulphurous acid was determined by titration with an iodine solution, using starch as indicator. One cc. N/10 iodine solution equals 0.0031 sodium oxide.

2. The free alkali was determined in the same solution by removing the blue color with a drop of a solution of sodium thiosulphate, adding a few drops of methyl orange and titrating with N/5 sulphuric acid. One cc. N/5 sulphuric acid—0.0062 sodium oxide.

3. The alkali present as sulphate was determined by evaporating a weighed quantity of the lye to dryness with an excess of sulphuric acid, igniting gently and weighing the residue as sodium sulphate. The alkali present as sulphate was obtained by subtracting 1 and 2 from this weight.

Paper Industry of Germany (U. S. Cons. Reps., Aug. 12, 1902). Contracts for wood pulp were readily closed during 1901, but towards the end of the year lower prices prevailed, owing to lack of water and foreign competition. The rise in the price of pine wood has ceased, owing to the fact that consumers are making their purchases direct, and wood from Finland is able to compete when the transportation charges are not too high. The wood-pulp industry urges an increase in the duty on dry pulp from one mark to three marks per hundred kilos and a duty of two marks per 100 kilos on moist pulp The following table shows the trade in packing paper for the years 1900 and 1901:

Description.	Import.		Export.	
	1901.	1902.	1901.	1902.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*
Ordinary	5,120	4,969	176,123	173,132
Smooth	32,591	33,037	255,392	285,278

Pulp and Cellulose in Norway (Foreign Office, Annual Series, No. 2873, G. Britain). British paper manufacturers are the chief consumers of mechanical wood pulp. Production in the autumn was restricted by the want of water, but the year 1901 was a better one than 1899.

The total value exported in 1901 was £762,159, as against £730,247 in 1900. There were two mills capable of producing jointly 17,000 tons during the year. Of the total quantity of 421,006 tons of pulp and cellulose exported in 1900 the United Kingdom took 275,201 tons. The production was about the same as in 1900; in some cases less, but prices were lower. Cellulose was subject to the same influences as pulp. Less of this article was exported than in 1900, and the value was also less in proportion. The principal demand was for the better qualities, the lower descriptions bringing very low prices. For 1901 the total estimated quantity and value exported was 93,789 tons and £656,846, as against 102,680 tons and £762,077 in 1900. As in the case of pulp, the United Kingdom took the bulk of the exportation.

Manufacture of Gas from Waste Liquors from Cellulose Factories. E. R. Besemfelder (Papier Ztg., 27, 2402, 2403, and 2442–2444; Journ. Soc. Chem. Ind., 21, 1192). The author has devised a continuous system of treatment, whereby he prepares a gas for heating and mechanical purposes and incidentally recovers all the sulphur.

RECENT PUBLICATIONS.

A First Book of Forestry. By FILIBERT ROTH, Chief of the Division of Forest Reserves, U. S. Department of the Interior. Pp. 291. Illustrated. Ginn & Co., Boston.

The scope of "First Book of Forestry" is clearly outlined in the preface where the author states that "a desire has been expressed to introduce this useful and interesting study into our public schools and country homes, and this volume is an attempt to provide a book on the subject which shall satisfy this demand. In keeping with this purpose there has been no attempt to write a text-book or manual of forestry; but an effort has been made to present in simple non-technical language some of the general principles underlying the science and to state the methods which are employed and the objects to be attained in the practice of forestry."

Professor Roth, with his wide experience as a student of and an instructor in forestry and as a practical forester, is admirably fitted to write a book on the above lines. The "First Book of Forestry" will be widely circulated, as it well deserves to be. It is written from the proper point of view, and in precisely the style to spread a knowledge of first principles of forestry.

The volume is divided into three parts. Part I contains a careful description of the physical make-up of a forest. In Part II the general principles of forestry are outlined, and in Part III related topics are discussed. There is also an Appendix, which contains the Doyle-Scribner log scale and a list of the more important woods and trees of the United States. The book is attractively printed, and the large number of excellent illustrations add much to its value.

How to Tell the Trees. First series: The Cone Bearers. By J. G. LEMMON, with hints on forestry by Mrs. LEMMON. Illustrated with 17 half-tones from drawings and photographs. Pp. 66. Price, 50 cents. Published by the authors. Oakland, Cal.

This little booklet, with its carefully prepared illustrations, is an excellent guide to the easy identification of conifers, and will be particularly interesting and instructive to Californians. A long introductory article is devoted to the question of the forest endowment of the Pacific slope.

Forestry Quarterly. Published by the New York State College of Forestry at Cornell University, Ithaca, N. Y., under the direction of a board of advisers consisting of Dr. B. E. Fernow, Dr. John Gifford, and Walter Mulford. Pp. 40. Single copies, 25 cents. Yearly subscription, $1.00.

The initial number of this publication has just appeared, and it will be issued, as its title indicates, four times a year. Its purpose, as stated in an editorial announcement, is to devote its pages to the professional or technical interests of forestry, and to that end solicits the interest and support of all workers in the field of forestry. By reviews and résumés it will aim to keep the profession in touch with current technical literature. The first issue is a very creditable one, and is not so extremely technical as to be without interest to the lay reader.

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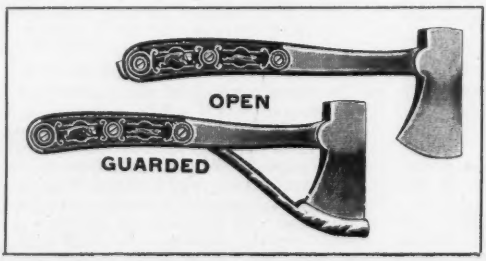

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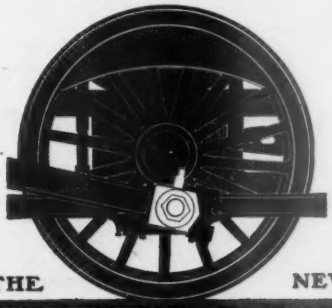

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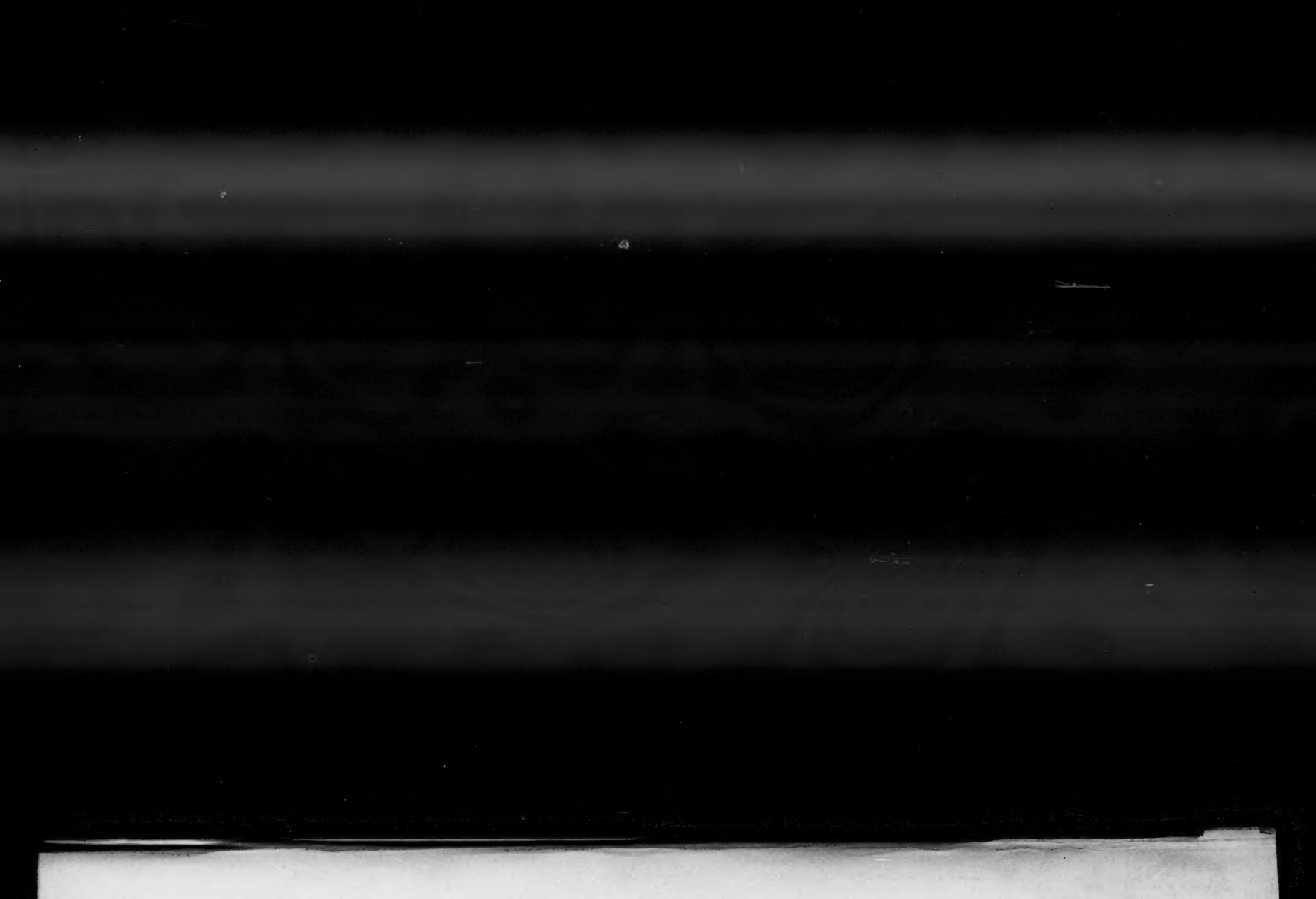
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